



NASA Technical Paper 1409

Effect of Casing Treatment on Performance of a Two-Stage High-Pressure-Ratio Fan

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National Aeronautics
and Space Administration

**Scientific and Technical
Information Office**

1979

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SUMMARY

A high-pressure-ratio (2.4), two-stage fan, which had been tested earlier with a solid casing, was tested with a treated casing (circumferential grooves over both rotors). The tests were conducted at 80 and 100 percent of design speed with uniform weight flow. Radial surveys of the flow conditions at the inlet and behind both stator-blade rows were made over the stable operating flow ranges for those speeds. The results were compared with those of the fan with solid casing. The treated casing significantly improved the flow range without changing the characteristic overall performance curves of total-pressure ratio and efficiency as functions of weight flow, other than extending them to lower weight flows. With the treated casing the stall margin, based on peak efficiency weight flow, increased from 8.5 to 14 percent at design speed and from 15.5 to 25 percent at 80 percent of design speed. Comparisons of radial distributions of performance parameters indicated no significant change in blade-element performance with the treated casing.

INTRODUCTION

A NASA program is being conducted to investigate the aerodynamic performance of a two-stage, high-pressure-ratio fan designed with spaced blade rows. The results of the testing of this fan (ref. 1) showed that at design stator-blade settings the fan was deficient in weight flow, pressure ratio, and efficiency. However, preliminary performance with stator-blade resets, conducted at part speed, showed an increase in weight flow and pressure ratio along with an increase in efficiency (approximately 3 percentage points). However, before the effect of stator-blade reset could be evaluated at design speed, three vibration dampers on the first-stage rotor failed.

Because of this performance potential, the first-stage rotor was rebuilt to the same aerodynamic design, except that larger vibration dampers were incorporated. Test results of this rebuilt fan (ref. 2) showed that large losses occurred in the region of the damper, decreasing the performance of the first rotor and stage and thereby lowering the overall performance of the fan. They also showed that the overall performance was insensitive to stator-blade reset at design speed.

The present investigation evaluated the performance of the two-stage fan with casing treatment over both rotors. Casing treatment has been successful in improving weight flow range and, in some cases, pressure ratio and efficiency (refs. 3 and 4).

Circumferentially grooved casings were selected because of their potential for improving these parameters as well as their ease of manufacture and low cost.

The performances of the two-stage fan with a treated casing (circumferentially grooved) and with a solid casing (ref. 2) are compared. The data are presented in both tabular and plotted form. The symbols are defined, and the equations are given in appendixes A and B, and the definitions and units used for the tabular data are presented in appendix C.

TWO-STAGE FAN DESIGN

The design of the two-stage fan is discussed in detail in reference 1. For convenience, all significant blade design parameters are listed in tables I to III. The flow path of the fan is shown in figure 1.

Cross-sectional sketches of the circumferentially grooved casings are shown in figure 2. The grooves, which extend only over the midportion of the blade (approximately 60 percent of blade tip axial chord), minimize rear-to-forward recirculation, but allow blade-to-blade recirculation in the circumferential direction. The estimated rotating tip clearance for both rotors was 0.04 centimeter.

APPARATUS AND PROCEDURE

Compressor Test Facility

The two-stage fan was tested in the multistage compressor facility, which is described in detail in reference 1. A schematic diagram of the facility is shown in figure 3. Atmospheric air enters the test facility at an inlet located on the roof of the building and flows through the flow measuring orifice, through the inlet butterfly throttle valves, and into the plenum chamber upstream of the test compressor. The air then passes through the test fan into the collector and is then exhausted either to the atmosphere or to an altitude exhaust system. Weight flow is controlled with a sleeve valve in the collector. For this series of tests the large inlet butterfly throttle valve remained fully open with the small valve fully closed, and the air was exhausted to the atmosphere.

Instrumentation

Radial surveys of the flow conditions were made at the fan inlet and behind the two stator-blade rows (see fig. 1). Total pressure, total temperature, and flow angle were

measured with combination probes (fig. 4). Each probe was positioned with a null-balancing, stream-direction-sensitive control system. The thermocouple was iron-constantan. All pressures were measured with calibrated transducers. Two combination probes were used at the compressor inlet and behind the first-stage stator, and four combination probes were used behind the second-stage stator. The circumferential locations of the probes at each measuring station are shown in figure 5. The probes behind the stators were circumferentially traversed one stator-blade passage clockwise from the nominal values shown. The fan weight flow was determined by means of a calibrated thin-plate orifice. An electronic speed counter, in conjunction with a magnetic pickup, was used to measure rotative speed (rpm).

The estimated errors of the data based on inherent accuracies of the instrumentation and recording system are as follows:

Weight flow, kg/sec	±0.3
Rotative speed, rpm	±30
Flow angle, deg	±1
Temperature, K	±0.6
Total pressure (station 1), N/cm^2	±0.07
Total pressure (station 2), N/cm^2	±0.10
Total pressure (station 3), N/cm^2	±0.17

Test Procedure

The data were taken over a range of weight flow from maximum flow to near stall at equivalent rotative speeds of 80 and 100 percent of design speed. At each selected flow data were recorded at 11 radial positions at each of the three measuring stations. At each radial position the combination probes behind the stators (stations 2 and 3) were circumferentially traversed to 10 equally spaced locations across a stator-blade gap. Values of pressure, temperature, and flow angle were measured at each circumferential position. At the fan inlet (station 1) radial traverses were made to measure pressure, temperature, and flow angle at each radial position.

Calculation Procedure

Circumferential values. - At each radial position, behind the two stator blade rows, circumferential arrays of total pressure, total temperature, and flow angle were generated across a stator blade gap by arithmetically averaging the measurements from the combination probes at each circumferential position.

Radial values. - At each radial position the arithmetically averaged values making

up the circumferential arrays of total pressure, total temperature, and flow angle across one blade gap were again averaged as follows to obtain the representative value (these values are reported herein): The total-pressure array was energy averaged, the total-temperature array was mass averaged, and the flow-angle array was arithmetically averaged.

Representative radial values of total pressure and total temperature between the rotor- and stator-blade rows (necessary for individual rotor- and stator-performance evaluations) were obtained from the arithmetically averaged circumferential arrays of total pressure and total temperature obtained downstream of the adjoining stator and translated upstream of the stator along design streamlines as follows: At each radial position total temperature was selected as the mass-averaged value of the arithmetically averaged values making up the circumferential array while the highest value of total pressure was selected from the arithmetically averaged values making up the circumferential array.

Data reduction. - Data were reduced using a computer program that calculates the radial distributions of static pressure at each measuring station and the radial distributions of flow angle at stations behind the rotors. Radial distributions of static pressure are calculated within the program from equations of continuity of mass flow and full radial equilibrium, which includes gradients of entropy and enthalpy and utilizes design streamline curvature, slope, and endwall blockage. Inputs to this program include equivalent weight flow, corrected speed, and radial distributions of total pressure and total temperature behind a rotating blade row and equivalent weight flow along with radial distributions of total pressure, total temperature, and flow angle behind a fixed blade row. To obtain overall performance for each rotor and stage, the radial values of total temperature were mass averaged, and the radial values of total pressure were energy averaged.

All data reported herein have been translated to the leading and trailing edges of each blade row by the method presented in reference 4. All pressures and temperatures were corrected to sea-level conditions based on the inlet conditions of the first-stage rotor. Weight flow and rotative speed were corrected to sea-level conditions based on the rotor inlet conditions of each stage.

RESULTS AND DISCUSSION

The experimental performance of the two-stage fan with casing treatment (circumferential grooves over both rotors) is compared with the performance of the fan with a solid casing. The data are compared in two main sections: The overall performance of the two-stage fan along with the performance of each individual stage and rotor; and radial distributions of several performance parameters for each rotor and stator. The plotted

casing treatment data, along with several parameters not shown in the figures, are presented in tabular form: The overall performance data are presented in tables IV and V, and the blade-element data in tables VI to IX. The definitions and units used in the tables are presented in appendix C. All solid casing data were taken from reference 2.

Overall Performance

Two-stage fan performance. - A comparison of the overall performance of the two-stage fan with a grooved casing and with a solid casing is presented in figure 6(a), where total-pressure ratio, total-temperature ratio, and adiabatic efficiency are plotted as functions of equivalent weight flow. Casing treatment had no effect on total-pressure ratio, total-temperature ratio, or efficiency. However, its use significantly improved the stall margin at both 80 and 100 percent of design speed. The stall margin at design speed, based on a peak efficiency weight flow of 32.70 kilograms per second, increased from 8.5 percent for the solid casing to 14 percent for the grooved casing. At 80 percent of design speed, the stall margin, based on a peak efficiency weight flow of 25.35 kilograms per second, increased from 15.5 to 25 percent.

First-stage performance. - The overall performance of the first stage and rotor are presented in figures 6(b) and (c), where total-pressure ratio, total-temperature ratio, and adiabatic efficiency are plotted as functions of equivalent weight flow at 80 and 100 percent of design speed. Overall stage performance (fig. 6(b)) shows that the grooved casing did not alter overall pressure ratio and efficiency over the flow range of the solid casing, but did allow the stage to operate to a lower flow rate. A peak efficiency value of 0.776 was obtained at a fan weight flow of 31.9 kilograms per second with both casings.

Overall rotor performance (fig. 7(a)) shows that the grooved casing produced similar results; that is, overall pressure ratio and efficiency performance curves were not altered, but the flow range was extended to a lower flow rate. A peak efficiency value of 0.810 was obtained at a fan weight flow of 31.9 kilograms per second (coincides with the stage peak efficiency weight flow) with both casing configurations.

Nondimensional stage performance. - The nondimensional performances of the stages and rotors are presented in figure 7. Head-rise coefficient, temperature-rise coefficient, and adiabatic efficiency are plotted as functions of stage flow coefficient. The performances are compared at design speed, and the design points are shown on all figures.

First stage: The overall performance of the first stage, at design speed (fig. 7(a)) shows that the grooved casing did not alter the stage head-rise coefficient or adiabatic efficiency over the flow-coefficient range of the solid casing but allowed the stage to operate to a lower flow coefficient. The flow coefficient at stall decreased from 0.425

with the solid casing to 0.403 with the grooved casing. Peak efficiency for the stage, with and without casing treatment, was 0.776; the design value was 0.838. Peak efficiency was obtained at a flow coefficient of 0.430 with both configurations.

The overall performance of the first-stage rotor (fig. 7(b)) shows that the grooved casing exhibits the same results as the stage; that is, the rotor head coefficient and efficiency are not altered, but the flow range is significantly increased. The peak efficiency for the rotor, with and without casing treatment, was 0.807; the design value was 0.886. Peak efficiency was obtained at a flow coefficient of 0.430 (coincides with stage peak efficiency flow coefficient) with both configurations.

Second stage: The overall performance of the second stage (fig. 7(c)) shows that casing treatment did not alter the stage head-rise coefficient and efficiency over the flow coefficient range of the solid casing, but allowed the stage to operate to a lower flow coefficient. The flow coefficient at stall decreased from 0.453 with the solid casing to 0.429 with the grooved casing. At the stage design flow coefficient value of 0.463, the stage exceeded its design head-rise coefficient but remained approximately 4 points below its design efficiency of 0.861.

The overall performance of the second-stage rotor (fig. 9(d)) shows results similar to that of the stage; that is, casing treatment did not alter the rotor head-rise coefficient and efficiency, but allowed the rotor to operate to a lower flow coefficient. Rotor peak efficiency is approximately 3.5 points below its design value of 0.902.

Radial Distributions

Comparisons of radial distributions of performance parameters for the two casings near fan peak efficiency weight flow (30.60 kg/sec with the grooved casing and 30.66 kg/sec with the solid casing) revealed no significant differences and are not presented herein. The radial distributions of performance parameters for the two configurations at design speed are compared at their respective stall weight flows (30.54 kg/sec with the grooved casing and 31.73 kg/sec with the solid casing). Performance is presented for the four blade rows in figure 8. With each blade row, some small differences are attributed to the differences in weight flow. At the lower stall flow with circumferential grooves, one would expect higher blade loadings (D-factors), higher energy addition, and higher incidence angles across the entire blade span.

CONCLUDING REMARKS

Casing treatments have been successful on rotors that were considered tip critical (i.e., blade elements in the tip region reach a critical operating condition and stall

before the remaining elements). Casing treatment applied over the tips of such rotors has improved flow range, stall margin, and, in some cases, pressure ratio and efficiency. In addition, in some instances, the efficiency degradation associated with increased rotor clearances has been reduced. For this two-stage fan the blade-element parameter values of meridional velocity, deviation angle, and loss coefficient in the tip regions, did not change rapidly as might be expected if the rotor tip had been critical. Yet, the application of casing treatment significantly increased the flow range and stall margin of the fan at both 80 and 100 percent of design speed. It is conceivable that these effects are confined to the narrow region which is less than 5 percent of span from the rotor tip (outside of our region of measurement).

SUMMARY OF RESULTS

A two-stage fan was tested earlier with a solid casing and found to be deficient in flow, stall margin, pressure ratio, and efficiency. The fan was retested with casing treatment (circumferential grooves) over the tips of both rotors. Tests were conducted at 80 and 100 percent of design speed. The overall and blade-element performances with and without casing treatment were compared. This investigation yielded the following principal results.

1. Casing treatment extended the operation of the fan to a lower flow rotor but had no effect on the fan overall values of total-pressure ratio, total-temperature ratio, and efficiency over the flow range of the solid casing.
2. Casing treatment increased the stall margin, based on peak efficiency weight flow, from 8.5 to 14 percent at design speed and from 15.5 to 25 percent at 80 percent of design speed.
3. Casing treatment did not significantly affect blade-element performance.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, October 19, 1978,
505-04.

APPENDIX A

SYMBOLS

A_{an}	annulus area at rotor leading edge, m^2
A_f	frontal area at rotor leading edge, m^2
C_p	specific heat at constant pressure, $1004 \text{ J/kg} \cdot \text{K}$
D	diffusion factor
i_{mc}	mean incidence angle, angle between inlet air direction and line tangent to blade mean camber line at leading edge, deg
i_{ss}	suction-surface incidence angle, angle between inlet air direction and line tangent to blade suction surface at leading edge, deg
N	rotative speed, rpm
P	total pressure, N/cm^2
p	static pressure, N/cm^2
r	radius, cm
SM	stall margin
T	total temperature, K
U	wheel speed, m/sec
V	air velocity, m/sec
W	weight flow, kg/sec
Z	axial distance referenced from rotor blade hub leading edge, cm
α_c	cone angle, deg
α_s	slope of streamline, deg
β	air angle, angle between air velocity and axial direction, deg
β'_c	relative meridional air angle based on cone angle, $\arctan(\tan \beta'_m \cos \alpha_c / \cos \alpha_s)$, deg
γ	ratio of specific heats (1.40)
δ	ratio of rotor inlet total pressure to standard pressure of 10.13 N/cm^2
δ^0	deviation angle, angle between exit air direction and tangent to blade mean camber line at trailing edge, deg

η	efficiency
θ	ratio of rotor-inlet total temperature to standard temperature of 288.2 K
κ_{mc}	angle between blade mean camber line and meridional plane, deg
κ_{ss}	angle between blade suction-surface camber line at leading edge and meridional plane, deg
σ	solidity, ratio of chord to spacing
$\bar{\omega}$	total-loss coefficient
$\bar{\omega}_p$	profile-loss coefficient
$\bar{\omega}_s$	shock-loss coefficient

Subscripts:

ad	adiabatic (temperature rise)
id	ideal
LE	blade leading edge
m	meridional direction
mom	momentum-rise
p	polytropic
ref	reference
TE	blade trailing edge
z	axial direction
θ	tangential direction
1	instrumentation plane upstream of first-stage rotor
2	instrumentation plane between first-stage stator and second-stage rotor
3	instrumentation plane downstream of second-stage stator

Superscript:

'	relative to blade
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APPENDIX B

EQUATIONS

Suction-surface incidence angle:

$$i_{ss} = (\beta'_c)_{LE} - \kappa_{ss} \quad (B1)$$

Mean incidence angle:

$$i_{mc} = (\beta'_c)_{LE} - (\kappa_{mc})_{LE} \quad (B2)$$

Deviation angle:

$$\delta^0 = (\beta'_c)_{TE} - (\kappa_{mc})_{TE} \quad (B3)$$

Diffusion factor:

$$D = 1 - \frac{V'_{TE}}{V'_{LE}} + \left| \frac{(rV_\theta)_{TE} - (rV_\theta)_{LE}}{(r_{TE} + r_{LE})\sigma (V'_{LE})} \right| \quad (B4)$$

Total-loss coefficient:

$$\bar{\omega} = \frac{(P'_{id})_{TE} - P'_{TE}}{P'_{LE} - p_{LE}} \quad (B5)$$

Profile-loss coefficient:

$$\bar{\omega}_p = \bar{\omega} - \bar{\omega}_s \quad (B6)$$

Total-loss parameter:

$$\frac{\bar{\omega} \cos (\beta'_m)_{TE}}{2\sigma} \quad (B7)$$

Profile-loss parameter:

$$\frac{\bar{\omega}_p \cos (\beta_m')_{TE}}{2\sigma} \quad (B8)$$

Adiabatic (temperature rise) efficiency:

$$\eta_{ad} = \frac{\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma} - 1}{\frac{T_{TE}}{T_{LE}} - 1} \quad (B9)$$

Temperature-rise coefficient :

$$\frac{C_p}{U_{tip}^2} (T_{TE} - T_{LE}) \quad (B10)$$

Equivalent weight flow:

$$\frac{W\sqrt{\theta}}{\delta} \quad (B11)$$

Equivalent rotative speed:

$$\frac{N}{\sqrt{\theta}} \quad (B12)$$

Weight flow per unit annulus area:

$$\frac{\frac{W\sqrt{\theta}}{\delta}}{A_{an}} \quad (B13)$$

Weight flow per unit frontal area:

$$\frac{\frac{W\sqrt{\theta}}{\delta}}{A_f} \quad (\text{B14})$$

Head-rise coefficient:

$$\frac{C_{pT_{LE}}}{U_{tip}^2} \left[\left(\frac{P_{TE}}{P_{LE}} \right)^{(\gamma-1)/\gamma} - 1 \right] \quad (\text{B15})$$

Flow coefficient:

$$\left(\frac{V_z}{U_{tip}} \right)_{LE} \quad (\text{B16})$$

Stall margin:

$$SM = \left[\frac{\left(\frac{P_{TE}}{P_{LE}} \right)_{stall}}{\left(\frac{P_{TE}}{P_{LE}} \right)_{ref}} \times \frac{\left(\frac{W\sqrt{\theta}}{\delta} \right)_{ref}}{\left(\frac{W\sqrt{\theta}}{\delta} \right)_{stall}} - 1 \right] \times 100 \quad (\text{B17})$$

Polytropic efficiency:

$$\eta_p = \frac{\ln \left(\frac{P_{TE}}{P_{LE}} \right)^{(\gamma-1)/\gamma}}{\ln \left(\frac{T_{TE}}{T_{LE}} \right)} \quad (\text{B18})$$

APPENDIX C

DEFINITIONS AND UNITS USED IN TABLES

ABS	absolute
AERO CHORD	aerodynamic chord, cm
BETAM	meridional air angle, deg
CHOKE MARGIN	ratio of excessive flow area above critical area to critical area
CONE ANGLE	angle between axial direction and conical surface representing blade element, deg
DELTA INC	difference between mean camber blade angle and suction-surface blade angle at leading edge, deg
DEV	deviation angle (defined by eq. (B3)), deg
D-FACT	diffusion factor (defined by eq. (B4))
EFF	adiabatic efficiency (defined by eq. (B9))
IN	inlet (leading edge of blade)
INCIDENCE	incidence angle (suction surface defined by eq. (B1) and mean surface by eq. (B2))
KIC	angle between blade mean camber line at leading edge and meridional plane, deg
KOC	angle between blade mean camber line at trailing edge and meridional plane, deg
KTC	angle between blade mean camber line at transition point and meridional plane, deg
LOSS COEFF	loss coefficient (total defined by eq. (B5) and profile by eq. (B6))
LOSS PARAM	loss parameter (total defined by eq. (B7) and profile by eq. (B8))
MERID	meridional
MERID VEL R	meridional velocity ratio
OUT	outlet (trailing edge of blade)
PERCENT SPAN	percent of blade span from tip at first-stage rotor outlet
PHISS	suction-surface camber ahead of assumed shock location, deg
PRESS	pressure, N/cm^2

PROF	profile
RADII	radius, cm
REL	relative to blade
RI	inlet radius (leading edge of blade), cm
RO	outlet radius (trailing edge of blade), cm
RP	radial position
RPM	equivalent rotative speed, rpm
SETTING ANGLE	angle between aerodynamic chord and meridional plane, deg
SOLIDITY	ratio of aerodynamic chord to blade spacing
SPEED	speed, m/sec
SS	suction surface
STREAMLINE SLOPE	slope of streamline, deg
TANG	tangential
TEMP	temperature, K
TI	thickness of blade at leading edge, cm
TM	thickness of blade at maximum thickness, cm
TO	thickness of blade at trailing edge, cm
TOT	total
TOTAL CAMBER	difference between inlet and outlet blade mean camber lines, deg
TURNING RATIO	ratio of mean camber line curvatures upstream and downstream of transition point
VEL	velocity, m/sec
WT FLOW	equivalent weight flow, kg/sec
ZI	axial distance from inlet hub to blade leading edge, cm
ZMC	axial distance from inlet hub to blade maximum thickness point, cm
ZO	axial distance from inlet hub to blade trailing edge, cm
ZTC	axial distance from inlet hub to transition point, cm

REFERENCES

1. Cunnan, Walter S.; Stevens, William; and Urasek, Donald C.: Design and Performance of a 427-Meter-Per-Second Tip-Speed Two-Stage Fan Having a 2.40-Pressure Ratio. NASA TP-1314, 1978.
2. Urasek, Donald C.; Cunnan, Walter S.; and Stevens, William: Performance of a Two-Stage Fan With Increased Damper Size on a First-Stage Rotor. NASA TP-1499, 1979.
3. Urasek, Donald C.; Lewis, George W., Jr.; and Moore, Royce D.: Effect of Casing Treatment on Performance of an Inlet Stage for a Transonic Multistage Compressor. NASA TM X-3347, 1976.
4. Moore, Royce D.; Kovich, George; and Blade, Robert J.: Effect of Casing Treatment on Overall and Blade-Element Performance of a Compressor Rotor. NASA TN D-6538, 1971.
5. Ball, Calvin L.; Janetzke, David D.; and Reid, Lonnie: Performance of 1380-Foot-Per-Second-Tip-Speed Axial-Flow Compressor Rotor with Blade Tip Solidity of 1.5. NASA TM X-2379, 1972.

TABLE I. - DESIGN OVERALL FAN PERFORMANCE

(a) Two-stage fan

TOTAL PRESSURE RATIO.....	2.400
TOTAL TEMPERATURE RATIO.....	1.335
ADIABATIC EFFICIENCY.....	0.846
POLYTROPIC EFFICIENCY.....	0.863
RPM (BASED ON FAN INLET).....	16042.8
WT FLOW.....	33.248

(b) First stage

ROTOR TOTAL PRESSURE RATIO.....	1.632
STAGE TOTAL PRESSURE RATIO.....	1.591
ROTOR TOTAL TEMPERATURE RATIO.....	1.169
STAGE TOTAL TEMPERATURE RATIO.....	1.169
ROTOR ADIABATIC EFFICIENCY.....	0.886
STAGE ADIABATIC EFFICIENCY.....	0.838
ROTOR POLYTROPIC EFFICIENCY.....	0.894
STAGE POLYTROPIC EFFICIENCY.....	0.848
ROTOR HEAD RISE COEFFICIENT.....	0.239
STAGE HEAD RISE COEFFICIENT.....	0.226
FLOW COEFFICIENT.....	0.453
WT FLOW PER UNIT FRONTAL AREA.....	164.041
WT FLOW PER UNIT ANNULUS AREA.....	195.287
TIP SPEED.....	426.720

(c) Second stage

ROTOR TOTAL PRESSURE RATIO.....	1.537
STAGE TOTAL PRESSURE RATIO.....	1.508
ROTOR TOTAL TEMPERATURE RATIO.....	1.144
STAGE TOTAL TEMPERATURE RATIO.....	1.144
ROTOR ADIABATIC EFFICIENCY.....	0.902
STAGE ADIABATIC EFFICIENCY.....	0.861
ROTOR POLYTROPIC EFFICIENCY.....	0.908
STAGE POLYTROPIC EFFICIENCY.....	0.868
ROTOR HEAD RISE COEFFICIENT.....	0.269
STAGE HEAD RISE COEFFICIENT.....	0.257
FLOW COEFFICIENT.....	0.463
WT FLOW PER UNIT FRONTAL AREA.....	181.801
WT FLOW PER UNIT ANNULUS AREA.....	260.974
TIP SPEED.....	405.341

EQUIVALENT VALUES BASED ON STAGE INLET

WT FLOW PER UNIT FRONTAL AREA.....	123.489
WT FLOW PER UNIT ANNULUS AREA.....	177.268
WT FLOW.....	22.584
RPM.....	14835.823
TIP SPEED.....	374.845

TABLE II. - DESIGN BLADE-ELEMENT PARAMETERS

(a) First-stage rotor

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
TIP	25.400	24.938	.0	41.7	68.5	62.1	288.2	1.194	10.14	1.632
1	24.704	24.266	.0	41.8	66.9	61.2	288.2	1.189	10.14	1.632
2	23.977	23.594	.0	41.8	65.4	60.1	288.2	1.185	10.14	1.632
3	22.538	22.250	.0	11.8	63.0	57.1	288.2	1.177	10.14	1.632
4	21.091	20.907	.0	42.1	60.7	53.7	288.2	1.170	10.14	1.632
5	20.219	20.101	.0	42.5	59.4	51.1	288.2	1.167	10.14	1.632
6	19.343	19.294	.0	43.2	58.1	48.2	288.2	1.166	10.14	1.632
7	18.167	18.219	.0	44.3	56.4	43.5	288.2	1.164	10.14	1.632
8	15.134	15.532	.0	46.9	51.9	26.5	288.2	1.160	10.14	1.632
9	13.534	14.188	.0	48.7	49.3	14.5	288.2	1.160	10.14	1.632
10	11.853	12.845	.0	50.2	46.5	.5	288.2	1.160	10.14	1.632
11	10.973	12.173	.0	50.7	44.9	-6.4	288.2	1.159	10.14	1.632
HUB	10.160	11.501	.0	51.1	43.3	-12.8	288.2	1.158	10.14	1.632

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
TIP	168.0	201.7	458.6	322.0	168.0	150.5	.0	134.3	426.7	419.0
1	177.1	201.5	451.3	311.8	177.1	150.2	.0	134.4	415.0	407.7
2	184.5	202.1	443.1	301.8	184.5	150.5	.0	134.8	402.8	396.4
3	192.9	205.3	424.9	282.0	192.9	153.0	.0	136.9	378.6	373.8
4	198.6	209.2	406.2	261.9	198.6	155.2	.0	140.3	354.3	351.2
5	200.8	212.3	394.6	249.4	200.8	156.5	.0	143.5	339.7	337.7
6	202.1	216.2	382.7	236.2	202.1	157.5	.0	148.1	325.0	324.1
7	202.8	222.2	366.5	219.4	202.8	159.2	.0	155.1	305.2	306.1
8	199.5	243.5	323.2	185.8	199.5	166.2	.0	177.9	254.3	260.9
9	195.3	258.8	299.7	176.5	195.3	170.9	.0	194.3	227.4	238.4
10	189.1	278.9	274.6	178.4	189.1	178.4	.0	214.4	199.1	215.8
11	185.0	291.1	261.2	185.5	185.0	184.3	.0	225.3	184.4	204.5
HUB	181.3	303.8	249.0	195.6	181.3	190.8	.0	236.4	170.7	193.2

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		STREAMLINE SLOPE		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
TIP	.506	.559	1.382	.893	.506	.417	-11.06	-12.78	.896	1.505
1	.535	.560	1.364	.866	.535	.417	-9.47	-10.60	.848	1.473
2	.559	.563	1.342	.840	.559	.419	-8.01	-8.73	.816	1.445
3	.586	.574	1.291	.789	.586	.428	-5.71	-5.93	.793	1.402
4	.605	.588	1.237	.736	.605	.436	-3.49	-3.45	.782	1.372
5	.612	.598	1.202	.702	.612	.441	-2.17	-2.09	.779	1.356
6	.616	.610	1.167	.666	.616	.444	-.86	-.79	.779	1.344
7	.619	.629	1.117	.621	.619	.450	.90	.87	.785	1.333
8	.608	.696	.984	.531	.608	.475	5.82	5.00	.833	1.344
9	.594	.744	.912	.508	.594	.491	8.91	7.17	.875	1.295
10	.574	.810	.833	.518	.574	.518	12.90	9.50	.944	1.225
11	.561	.850	.791	.542	.561	.538	15.41	10.77	.996	1.176
HUB	.549	.893	.753	.575	.549	.561	17.84	12.07	1.052	1.129

RP	PERCENT		INCIDENCE		DEV	D-FACT	E-F	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
TIP	.00	2.1	.0	.0	2.8	.410	.773	.177	.098	.032	.018
1	5.00	2.3	.0	.0	2.8	.420	.794	.160	.091	.029	.016
2	10.00	2.5	.0	.0	2.9	.429	.814	.145	.084	.026	.015
3	20.00	3.0	-.0	.0	3.1	.447	.849	.119	.073	.022	.014
4	30.00	3.4	-.0	.0	3.4	.467	.882	.096	.061	.018	.012
5	36.00	3.6	-.0	.0	3.7	.481	.897	.086	.056	.017	.011
6	42.00	3.9	-.0	.0	4.0	.498	.905	.081	.057	.016	.011
7	50.00	4.2	-.0	.0	4.5	.520	.916	.076	.058	.015	.012
8	70.00	4.9	.0	.0	6.6	.557	.936	.067	.058	.014	.012
9	80.00	5.0	.0	.0	7.9	.552	.939	.072	.070	.015	.014
10	90.00	4.8	.0	.0	9.1	.502	.940	.081	.081	.015	.015
11	95.00	4.6	.0	.0	10.0	.447	.944	.083	.083	.014	.014
HUB	100.00	4.3	.0	.0	11.6	.376	.948	.082	.082	.013	.013

TABLE II. - Continued. DESIGN BLADE-ELEMENT PARAMETERS

(b) First-stage stator

RP	RADII		ABS IN	BETAM OUT	REL IN	BETAM OUT	TOTAL TEMP		TOTAL IN	PRESS RATIO
	IN	OUT					IN	RATIO		
TIP	24.384	24.384	38.5	.0	38.5	.0	344.2	1.000	16.54	.979
1	23.758	23.761	38.2	.0	38.2	.0	342.7	1.000	16.54	.980
2	23.167	23.200	37.9	.0	37.9	.0	341.3	1.000	16.54	.981
3	21.981	22.068	37.9	.0	37.9	.0	339.1	1.000	16.54	.982
4	20.787	20.927	38.1	.0	38.1	.0	337.2	1.000	16.54	.982
5	20.070	20.243	38.5	.0	38.5	.0	336.4	1.000	16.54	.982
6	19.350	19.558	39.2	.0	39.2	.0	335.9	1.000	16.54	.982
7	18.388	18.650	40.3	.0	40.3	.0	335.4	1.000	16.54	.980
8	15.962	16.388	43.6	.0	43.6	.0	334.4	1.000	16.54	.972
9	14.733	15.263	45.9	.0	45.9	.0	334.2	1.000	16.54	.964
10	13.493	14.144	48.7	.0	48.7	.0	334.2	1.000	16.54	.950
11	12.868	13.586	50.1	.0	50.1	.0	334.0	1.000	16.54	.940
HUB	12.189	12.931	51.7	.0	51.7	.0	333.8	1.000	16.54	.928

RP	ABS VEL		REL IN	VEL OUT	MERID VEL		TANG VEL		WHEEL IN	SPEED OUT
	IN	OUT			IN	OUT	IN	OUT		
TIP	221.0	174.2	221.0	174.2	173.0	174.2	137.6	.0	.0	.0
1	222.1	174.2	222.1	174.2	174.7	174.2	137.2	.0	.0	.0
2	223.3	174.3	223.3	174.3	176.1	174.3	137.3	.0	.0	.0
3	225.8	174.7	225.8	174.7	178.3	174.7	138.6	.0	.0	.0
4	228.7	175.2	228.7	175.2	180.0	175.2	141.1	.0	.0	.0
5	230.9	175.5	230.9	175.5	180.7	175.5	143.7	.0	.0	.0
6	233.6	175.6	233.6	175.6	181.0	175.6	147.7	.0	.0	.0
7	237.7	175.3	237.7	175.3	181.4	175.3	153.7	.0	.0	.0
8	251.2	173.4	251.2	173.4	182.0	173.4	173.1	.0	.0	.0
9	260.6	170.8	260.6	170.8	181.3	170.8	187.1	.0	.0	.0
10	271.7	166.8	271.7	166.8	179.5	166.8	204.0	.0	.0	.0
11	277.6	164.6	277.6	164.6	178.0	164.6	213.0	.0	.0	.0
HUB	284.2	162.0	284.2	162.0	176.2	162.0	223.0	.0	.0	.0

RP	ABS MACH NO		REL IN	MACH NO OUT	MERID MACH NO		STREAMLINE SLOPE		MERID VEL R	PEAK SS MACH NO
	IN	OUT			IN	OUT	IN	OUT		
TIP	.616	.479	.616	.479	.482	.479	-1.22	.46	1.007	.839
1	.621	.480	.621	.480	.489	.480	-.81	.50	.997	.822
2	.626	.481	.626	.481	.494	.481	-.45	.59	.990	.811
3	.636	.484	.636	.484	.502	.484	.21	.90	.980	.803
4	.647	.487	.647	.487	.509	.487	.93	1.33	.973	.805
5	.654	.489	.654	.489	.512	.489	1.38	1.65	.971	.811
6	.663	.489	.663	.489	.514	.489	1.85	2.01	.970	.824
7	.677	.489	.677	.489	.516	.489	2.51	2.50	.966	.843
8	.720	.484	.720	.484	.522	.484	4.34	3.75	.953	.910
9	.750	.477	.750	.477	.522	.477	5.37	4.25	.942	.961
10	.786	.465	.786	.465	.519	.465	6.43	4.42	.929	1.027
11	.805	.459	.805	.459	.516	.459	6.97	4.30	.925	1.064
HUB	.828	.451	.828	.451	.513	.451	7.54	4.13	.919	1.106

RP	PERCENT		INCIDENCE MEAN	SS	DEV	D-FACT	EFF	LOSS COEFF		LOSS TOT	PARAM PROF
	SPAN							TOT	PROF		
TIP	.00		3.0	-3.0	17.0	.457	.000	.094	.094	.037	.037
1	5.00		3.0	-3.0	13.9	.453	.000	.086	.086	.033	.033
2	10.00		3.0	-3.0	11.9	.449	.000	.082	.082	.031	.031
3	20.00		2.9	-3.0	10.0	.444	.000	.077	.077	.027	.027
4	30.00		2.8	-3.0	9.3	.441	.000	.073	.073	.025	.025
5	36.00		2.8	-3.0	9.0	.442	.000	.072	.072	.023	.023
6	42.00		2.7	-3.0	8.8	.446	.000	.072	.072	.023	.023
7	50.00		2.7	-3.0	8.6	.454	.000	.077	.077	.023	.023
8	70.00		2.5	-3.0	9.0	.486	.000	.095	.095	.025	.025
9	80.00		2.3	-3.0	9.7	.514	.000	.115	.115	.028	.028
10	90.00		2.2	-3.0	11.7	.549	.000	.150	.150	.033	.033
11	95.00		2.0	-3.0	13.2	.565	.000	.173	.173	.037	.037
HUB	100.00		1.9	-3.0	15.0	.583	.000	.198	.198	.040	.040

TABLE II. - Continued. DESIGN BLADE-ELEMENT PARAMETERS

(c) Second-stage rotor

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
TIP	24.127	23.719	.0	39.2	65.5	57.3	344.3	1.157	16.20	1.530
1	23.533	23.187	.0	39.5	64.4	56.8	342.7	1.154	16.21	1.529
2	23.002	22.707	.0	39.8	63.5	56.2	341.3	1.151	16.22	1.528
3	21.951	21.741	.0	40.0	62.1	54.3	339.1	1.147	16.24	1.527
4	20.900	20.779	.0	40.3	60.7	52.1	337.2	1.143	16.24	1.526
5	20.272	20.206	.0	40.7	60.0	50.5	336.4	1.141	16.24	1.527
6	19.646	19.636	.0	41.3	59.2	48.6	335.9	1.140	16.23	1.527
7	18.813	18.888	.0	42.1	58.3	45.7	335.4	1.139	16.20	1.530
8	16.721	17.072	.0	44.6	56.5	36.4	334.4	1.140	16.08	1.542
9	15.652	16.198	.0	46.6	56.1	30.0	334.2	1.142	15.94	1.555
10	14.537	15.351	.0	49.3	56.7	21.6	334.2	1.147	15.71	1.578
11	13.951	14.938	.0	50.7	57.7	16.5	334.0	1.150	15.55	1.594
HUB	13.289	14.455	.0	52.4	59.2	10.1	333.8	1.154	15.36	1.614

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
TIP	185.0	216.9	445.6	310.7	185.0	168.0	.0	137.1	405.3	398.5
1	189.4	214.6	438.4	302.3	189.4	165.5	.0	136.6	395.3	389.5
2	192.3	213.4	431.7	294.9	192.3	164.0	.0	136.4	386.4	381.5
3	195.2	213.5	417.3	280.5	195.2	163.5	.0	137.3	368.8	365.3
4	196.7	214.6	402.5	266.3	196.7	163.6	.0	138.9	351.1	349.1
5	197.0	216.1	393.4	257.4	197.0	163.8	.0	140.9	340.6	339.5
6	196.6	218.2	384.2	247.9	196.6	164.0	.0	144.0	330.1	329.9
7	195.2	221.6	371.4	235.6	195.2	164.4	.0	148.6	316.1	317.3
8	186.0	233.8	336.9	206.9	186.0	166.6	.0	164.1	280.9	286.8
9	176.6	242.3	316.7	192.2	176.6	166.4	.0	176.0	262.9	272.1
10	160.2	253.7	292.1	178.0	160.2	165.5	.0	192.4	244.2	257.9
11	147.9	260.9	277.2	172.2	147.9	165.1	.0	202.0	234.4	251.0
HUB	133.2	269.7	260.0	167.3	133.2	164.8	.0	213.6	223.3	242.8

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		STREAMLINE SLOPE		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
TIP	.511	.559	1.230	.801	.511	.433	-8.36	-6.25	.908	1.414
1	.525	.555	1.214	.782	.525	.428	-6.98	-5.15	.874	1.386
2	.534	.554	1.199	.765	.534	.426	-5.85	-4.24	.853	1.366
3	.545	.557	1.164	.732	.545	.427	-3.92	-2.71	.837	1.343
4	.551	.563	1.127	.699	.551	.429	-2.14	-1.24	.832	1.324
5	.552	.568	1.103	.677	.552	.431	-1.12	-.38	.832	1.314
6	.552	.575	1.078	.653	.552	.432	-.11	-.47	.834	1.304
7	.548	.585	1.042	.622	.548	.434	1.22	1.62	.843	1.298
8	.521	.620	.944	.549	.521	.442	4.72	4.68	.896	1.260
9	.494	.644	.886	.511	.494	.443	6.62	6.36	.943	1.222
10	.446	.676	.813	.474	.446	.441	8.58	8.20	1.033	1.184
11	.411	.696	.770	.459	.411	.440	9.57	9.21	1.116	1.165
HUB	.369	.721	.720	.447	.369	.440	10.69	10.40	1.237	1.143

	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS	COEFF	LOSS	PARAM
RP	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
TIP	.30	2.5	-.0	2.4	.421	.819	.136	.095	.028	.020
1	5.00	2.5	-.0	2.5	.427	.835	.124	.089	.026	.019
2	10.00	2.5	-.0	2.6	.433	.849	.114	.084	.024	.017
3	20.00	2.7	-.0	3.0	.444	.873	.097	.074	.020	.015
4	30.00	3.1	-.0	3.4	.455	.897	.081	.063	.017	.013
5	36.00	3.4	-.0	3.7	.463	.907	.074	.059	.016	.012
6	42.00	3.7	-.0	4.0	.474	.913	.071	.059	.015	.012
7	50.00	4.2	-.0	4.6	.488	.923	.066	.057	.014	.012
8	70.00	5.2	-.0	6.4	.520	.939	.060	.058	.013	.013
9	80.00	5.4	-.0	7.8	.539	.942	.065	.064	.014	.014
10	90.00	5.2	-.0	9.9	.553	.942	.076	.076	.017	.017
11	95.00	4.9	-.0	11.3	.553	.944	.082	.082	.018	.018
HUB	100.00	4.7	.1	12.8	.545	.945	.091	.091	.020	.020

TABLE II. - Concluded. DESIGN BLADE-ELEMENT PARAMETERS

(d) Second-stage stator

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
TIP	23.622	23.622	39.2	.0	39.2	.0	398.4	1.000	24.79	.983
1	23.108	23.129	38.8	.0	38.8	.0	395.4	1.000	24.79	.984
2	22.646	22.686	38.5	.0	38.5	.0	392.9	1.000	24.79	.984
3	21.728	21.802	38.2	.0	38.2	.0	388.8	1.000	24.79	.985
4	20.824	20.923	38.1	.0	38.1	.0	385.3	1.000	24.79	.986
5	20.287	20.400	38.3	.0	38.3	.0	383.8	1.000	24.79	.985
6	19.757	19.884	38.8	.0	38.8	.0	383.0	1.000	24.79	.985
7	19.060	19.204	39.5	.0	39.5	.0	382.2	1.000	24.79	.984
8	17.367	17.566	42.1	.0	42.1	.0	381.0	1.000	24.79	.979
9	16.547	16.786	44.5	.0	44.5	.0	381.7	1.000	24.79	.975
10	15.739	16.040	48.0	.0	48.0	.0	383.3	1.000	24.79	.967
11	15.338	15.682	50.3	.0	50.3	.0	384.2	1.000	24.79	.963
HUB	14.869	15.237	52.9	.0	52.9	.0	385.3	1.000	24.79	.958

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL IN	SPEED OUT
	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
TIP	217.8	170.2	217.8	170.2	168.8	170.2	137.7	.0	.0	.0
1	218.8	170.3	218.8	170.3	170.6	170.3	137.0	.0	.0	.0
2	219.8	170.3	219.8	170.3	172.0	170.3	136.8	.0	.0	.0
3	222.1	170.3	222.1	170.3	174.5	170.3	137.4	.0	.0	.0
4	224.5	170.3	224.5	170.3	176.6	170.3	138.6	.0	.0	.0
5	226.3	170.3	226.3	170.3	177.5	170.3	140.4	.0	.0	.0
6	228.4	170.3	228.4	170.3	178.0	170.3	143.1	.0	.0	.0
7	231.4	170.1	231.4	170.1	178.5	170.1	147.3	.0	.0	.0
8	240.3	169.5	240.3	169.5	178.2	169.5	161.3	.0	.0	.0
9	245.9	168.5	245.9	168.5	175.5	168.5	172.3	.0	.0	.0
10	252.3	167.5	252.3	167.5	168.8	167.5	187.6	.0	.0	.0
11	255.7	167.5	255.7	167.5	163.4	167.5	196.7	.0	.0	.0
HUB	260.2	167.4	260.2	167.4	156.8	167.4	207.7	.0	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		STREAMLINE SLOPE		MERID VEL R	PEAK SS MACH NO
	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
TIP	.562	.434	.562	.434	.435	.434	-.10	-.03	1.008	.787
1	.567	.435	.567	.435	.442	.435	.19	.18	.998	.775
2	.571	.437	.571	.437	.447	.437	.44	.35	.990	.767
3	.581	.439	.581	.439	.457	.439	.88	.65	.975	.759
4	.591	.441	.591	.441	.465	.441	1.32	.90	.964	.758
5	.597	.442	.597	.442	.468	.442	1.58	1.01	.959	.763
6	.603	.443	.603	.443	.470	.443	1.86	1.11	.956	.773
7	.613	.443	.613	.443	.473	.443	2.23	1.24	.953	.787
8	.639	.442	.639	.442	.474	.442	3.23	1.45	.951	.838
9	.655	.439	.655	.439	.467	.439	3.81	1.53	.960	.884
10	.672	.435	.672	.435	.449	.435	4.55	1.55	.993	.954
11	.681	.435	.681	.435	.435	.435	5.01	1.52	1.025	.999
HUB	.693	.434	.693	.434	.417	.434	5.57	1.49	1.068	1.056

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
TIP	.00	2.8	-3.0	16.2	.471	.000	.086	.086	.034	.034	
1	5.00	2.7	-3.0	14.0	.466	.000	.083	.083	.032	.032	
2	10.00	2.7	-3.0	12.4	.463	.000	.080	.080	.031	.031	
3	20.00	2.7	-3.0	10.4	.461	.000	.073	.073	.027	.027	
4	30.00	2.6	-3.0	9.5	.459	.000	.069	.069	.024	.024	
5	36.00	2.6	-3.0	9.3	.460	.000	.068	.068	.023	.023	
6	42.00	2.6	-3.0	9.2	.464	.000	.069	.069	.023	.023	
7	50.00	2.5	-3.0	9.1	.470	.000	.072	.072	.023	.023	
8	70.00	2.3	-3.0	9.5	.492	.000	.086	.086	.025	.025	
9	80.00	2.3	-3.0	10.5	.511	.000	.102	.102	.029	.029	
10	90.00	2.1	-3.0	12.8	.533	.000	.125	.125	.034	.034	
11	95.00	2.1	-3.0	14.7	.544	.000	.138	.138	.036	.036	
HUB	100.00	1.9	-3.0	17.2	.557	.000	.156	.156	.039	.039	

TABLE III. - BLADE GEOMETRY

(a) First-stage rotor

RP	PERCENT		RADII		BLADE ANGLES			DELTA	CONE
	SPAN	RI	RO	KIC	KTC	KOC	INC		
TIP	0.	25.400	24.938	66.34	63.45	59.36	2.04	-12.624	
1	5.	24.704	24.266	64.50	61.99	58.37	2.23	-11.279	
2	10.	23.977	23.594	62.80	60.43	57.16	2.46	-9.342	
3	20.	22.538	22.250	60.02	57.21	54.03	3.01	-6.371	
4	30.	21.091	20.907	57.33	53.66	50.21	3.40	-3.741	
5	36.	20.219	20.101	55.77	51.46	47.46	3.64	-2.288	
6	42.	19.343	19.294	54.23	49.15	44.18	3.89	-.891	
7	50.	18.167	18.219	52.18	45.94	39.01	4.21	.898	
8	70.	15.134	15.532	46.99	36.89	19.96	4.88	5.684	
9	80.	13.534	14.188	44.35	31.92	6.51	4.98	8.621	
10	90.	11.853	12.845	41.73	27.08	-8.65	4.78	12.240	
11	95.	10.973	12.173	40.46	24.92	-16.35	4.53	14.460	
HUB	100.	10.160	11.501	39.30	23.02	-24.12	4.27	15.866	

RP	BLADE THICKNESSES			AXIAL DIMENSIONS			
	TI	TM	TO	ZI	ZMC	ZTC	ZO
TIP	.047	.136	.047	1.337	2.318	2.722	3.401
1	.052	.148	.051	1.268	2.320	2.688	3.466
2	.056	.161	.056	1.202	2.322	2.647	3.531
3	.065	.187	.066	1.088	2.324	2.544	3.659
4	.074	.212	.076	.973	2.325	2.412	3.795
5	.079	.228	.081	.903	2.325	2.319	3.879
6	.085	.244	.087	.832	2.324	2.215	3.969
7	.093	.265	.095	.732	2.320	2.057	4.094
8	.113	.320	.115	.439	2.293	1.555	4.437
9	.124	.350	.126	.273	2.287	1.254	4.589
10	.136	.385	.137	.117	2.285	.952	4.687
11	.143	.405	.143	.054	2.293	.816	4.706
HUB	.149	.423	.150	.000	2.301	.696	4.719

RP	AERO			TURNING		CHOKE	
	CHORD	ANGLE	CAMBER	SOLIDITY	RATIO	PHISS	MARGIN
TIP	4.739	63.84	6.97	1.288	.298	3.56	.040
1	4.752	62.23	6.13	1.328	.338	3.13	.040
2	4.750	60.60	5.64	1.367	.403	2.92	.040
3	4.743	57.38	5.99	1.450	.621	3.16	.040
4	4.739	53.84	7.12	1.544	.935	3.72	.040
5	4.737	51.54	8.31	1.608	1.088	4.13	.040
6	4.736	49.01	10.05	1.678	1.178	4.63	.040
7	4.736	45.26	13.17	1.782	1.251	5.39	.040
8	4.748	32.63	27.03	2.119	1.356	7.99	.040
9	4.770	24.11	37.84	2.355	1.467	9.56	.040
10	4.826	14.51	50.38	2.674	1.660	10.99	.040
11	4.871	9.66	56.81	2.881	1.786	11.47	.040
HUB	4.923	4.85	63.42	3.111	1.909	11.85	.040

(b) First-stage stator

RP	PERCENT		RADII		BLADE ANGLES			DELTA	CONE
	SPAN	RI	RO	KIC	KTC	KOC	INC		
TIP	0.	24.384	24.384	35.53	18.39	-16.99	5.96	.057	
1	5.	23.758	23.761	35.19	19.29	-13.93	5.96	.057	
2	10.	23.167	23.200	34.98	20.01	-11.87	5.96	.331	
3	20.	21.981	22.068	34.96	21.01	-10.04	5.91	.884	
4	30.	20.787	20.927	35.24	21.89	-9.30	5.84	1.434	
5	36.	20.070	20.243	35.69	22.52	-8.97	5.80	1.778	
6	42.	19.350	19.558	36.45	23.26	-8.80	5.75	2.141	
7	50.	18.388	18.650	37.60	24.34	-8.62	5.67	2.702	
8	70.	15.962	16.388	41.11	27.43	-8.96	5.45	4.427	
9	80.	14.733	15.263	43.56	29.39	-9.73	5.32	5.527	
10	90.	13.493	14.144	46.49	31.56	-11.65	5.14	6.797	
11	95.	12.868	13.586	48.04	32.67	-13.16	5.03	7.501	
HUB	100.	12.189	12.931	49.76	33.90	-15.03	4.89	7.754	

RP	BLADE THICKNESSES			AXIAL DIMENSIONS			
	TI	TM	TO	ZI	ZMC	ZTC	ZO
TIP	.150	.460	.150	10.457	13.179	12.211	16.112
1	.146	.454	.146	10.474	13.178	12.198	16.106
2	.141	.448	.141	10.486	13.177	12.181	16.101
3	.131	.436	.131	10.497	13.175	12.131	16.094
4	.122	.425	.121	10.507	13.176	12.079	16.092
5	.117	.418	.115	10.515	13.175	12.054	16.091
6	.111	.411	.110	10.524	13.172	12.034	16.089
7	.103	.402	.102	10.541	13.171	12.011	16.089
8	.085	.379	.084	10.584	13.161	11.938	16.087
9	.075	.367	.074	10.613	13.156	11.899	16.088
10	.066	.355	.065	10.639	13.146	11.846	16.094
11	.061	.350	.060	10.647	13.140	11.810	16.098
HUB	.055	.344	.055	10.656	13.132	11.768	16.103

RP	AERO			TURNING		CHOKE	
	CHORD	ANGLE	CAMBER	SOLIDITY	RATIO	PHISS	MARGIN
TIP	5.729	9.29	52.52	1.271	1.000	10.86	.224
1	5.728	10.63	49.12	1.305	1.000	9.79	.210
2	5.729	11.56	46.85	1.337	1.000	9.02	.199
3	5.729	12.47	45.00	1.408	1.000	8.17	.182
4	5.730	12.99	44.55	1.487	1.000	7.69	.168
5	5.731	13.39	44.66	1.539	1.000	7.57	.161
6	5.732	13.86	45.25	1.594	1.000	7.64	.154
7	5.734	14.54	46.22	1.676	1.000	7.74	.145
8	5.743	16.18	50.07	1.921	1.000	8.19	.121
9	5.751	17.07	53.29	2.075	1.000	8.64	.112
10	5.762	17.65	58.14	2.256	1.000	9.33	.106
11	5.769	17.73	61.20	2.360	1.000	9.72	.106
HUB	5.768	17.70	64.79	2.485	1.000	10.16	.106

TABLE III. - Concluded. BLADE GEOMETRY

(c) Second-stage rotor

RP	PERCENT		RADII		BLADE ANGLES			DELTA	CONE
	SPAN	RI	RO	KIC	KTC	KOC	INC	ANGLE	
TIP	0.	24.127	23.719	62.90	58.37	54.69	2.57	-8.911	
1	5.	23.533	23.187	61.90	57.70	54.18	2.50	-7.354	
2	10.	23.002	22.707	61.04	56.96	53.48	2.50	-6.131	
3	20.	21.951	21.741	59.42	55.00	51.31	2.69	-4.123	
4	30.	20.900	20.779	57.67	52.82	48.70	3.07	-2.246	
5	36.	20.272	20.206	56.59	51.42	46.79	3.37	-1.186	
6	42.	19.646	19.636	55.52	50.00	44.57	3.70	-.183	
7	50.	18.813	18.888	54.14	48.02	41.14	4.17	1.246	
8	70.	16.721	17.072	51.30	42.93	29.92	5.19	5.162	
9	80.	15.657	16.198	50.65	40.51	22.09	5.41	7.585	
10	90.	14.537	15.351	51.37	38.55	11.58	5.23	10.660	
11	95.	13.951	14.938	52.58	37.90	5.04	4.95	12.566	
HUB	100.	13.289	14.455	54.11	37.26	-2.85	4.58	14.381	

RP	BLADE THICKNESSES			AXIAL DIMENSIONS			
	TI	TM	TO	ZI	ZMC	ZTC	ZO
TIP	.060	.173	.060	22.053	23.285	23.731	24.661
1	.065	.175	.066	22.019	23.291	23.694	24.699
2	.070	.179	.071	21.987	23.295	23.657	24.737
3	.079	.196	.080	21.917	23.300	23.571	24.826
4	.089	.222	.090	21.836	23.299	23.462	24.919
5	.094	.241	.096	21.786	23.299	23.390	24.980
6	.100	.261	.102	21.736	23.299	23.312	25.044
7	.107	.289	.110	21.667	23.296	23.199	25.134
8	.126	.357	.129	21.486	23.280	22.878	25.374
9	.135	.385	.138	21.393	23.264	22.702	25.500
10	.146	.406	.147	21.299	23.239	22.517	25.623
11	.152	.413	.153	21.251	23.220	22.421	25.679
HUB	.159	.419	.159	21.197	23.196	22.312	25.744

RP	AERO CHORD	SETTING ANGLE	TOTAL CAMBER	SOLIDITY	TURNING RATIO	PHISS	CHOKE MARGIN
TIP	5.111	59.28	8.21	1.292	.599	5.12	.040
1	5.105	58.46	7.72	1.322	.631	4.68	.040
2	5.103	57.62	7.56	1.350	.676	4.48	.040
3	5.099	55.57	8.11	1.412	.814	4.68	.040
4	5.096	53.25	8.97	1.479	.948	4.96	.040
5	5.095	51.71	9.80	1.523	.996	5.16	.040
6	5.095	50.05	10.95	1.569	1.000	5.36	.040
7	5.096	47.66	13.00	1.635	1.001	5.73	.042
8	5.105	40.67	21.37	1.827	1.000	7.13	.054
9	5.118	36.49	28.56	1.944	1.000	8.40	.069
10	5.146	31.70	39.79	2.082	1.000	10.65	.108
11	5.171	29.12	47.54	2.165	1.000	12.34	.146
HUB	5.203	25.97	56.96	2.269	1.000	14.36	.192

(d) Second-stage stator

	PERCENT		RADII		BLADE ANGLES			DELTA	CONE
RP	SPAN	RI	RO	KIC	KTC	KOC	INC	ANGLE	
TIP	0.	23.622	23.622	36.44	18.58	-16.16	5.75	.057	
1	5.	23.108	23.129	36.03	19.25	-14.04	5.75	.279	
2	10.	22.646	22.686	35.76	19.80	-12.44	5.74	.531	
3	20.	21.728	21.802	35.53	20.71	-10.38	5.69	.975	
4	30.	20.824	20.923	35.50	21.38	-9.53	5.64	1.318	
5	36.	20.287	20.400	35.74	21.82	-9.30	5.59	1.504	
6	42.	19.757	19.884	36.24	22.33	-9.20	5.55	1.688	
7	50.	19.060	19.204	37.03	23.07	-9.11	5.49	1.925	
8	70.	17.367	17.566	39.81	25.20	-9.53	5.33	2.663	
9	80.	16.547	16.786	42.24	26.63	-10.46	5.23	3.211	
10	90.	15.739	16.040	45.90	28.35	-12.81	5.11	4.058	
11	95.	15.338	15.682	48.24	29.31	-14.71	5.02	4.649	
HUB	100.	14.869	15.237	51.08	30.44	-17.17	4.92	4.978	

RP	BLADE THICKNESSES			AXIAL DIMENSIONS			
	TI	TM	TO	ZI	ZMC	ZTC	ZO
TIP	.125	.356	.125	30.141	32.232	31.540	34.500
1	.121	.350	.121	30.150	32.233	31.526	34.497
2	.117	.345	.117	30.157	32.233	31.512	34.494
3	.109	.335	.109	30.166	32.231	31.479	34.488
4	.102	.326	.102	30.172	32.232	31.442	34.487
5	.097	.321	.097	30.176	32.232	31.425	34.486
6	.092	.315	.092	30.181	32.232	31.412	34.486
7	.087	.308	.086	30.188	32.229	31.396	34.485
8	.072	.290	.072	30.214	32.226	31.368	34.487
9	.066	.281	.065	30.234	32.222	31.366	34.491
10	.059	.273	.058	30.259	32.217	31.371	34.501
11	.055	.269	.055	30.272	32.212	31.372	34.507
HUB	.051	.264	.051	30.288	32.205	31.373	34.516

RP	AERO CHORD	SETTING ANGLE	TOTAL CAMBER	SOLIDITY	TURNING RATIO	PHISS	CHOKE MARGIN
TIP	4.426	10.14	52.60	1.253	1.000	12.03	.301
1	4.426	11.00	50.07	1.280	1.000	11.07	.286
2	4.426	11.67	48.20	1.305	1.000	10.34	.274
3	4.427	12.59	45.90	1.360	1.000	9.35	.254
4	4.427	13.00	45.02	1.418	1.000	8.75	.239
5	4.427	13.24	45.04	1.455	1.000	8.60	.231
6	4.428	13.54	45.44	1.493	1.000	8.64	.224
7	4.428	13.99	46.14	1.547	1.000	8.75	.216
8	4.430	15.18	49.34	1.695	1.000	9.47	.199
9	4.432	15.95	52.70	1.778	1.000	10.52	.197
10	4.435	16.63	58.71	1.866	1.000	12.52	.211
11	4.438	16.88	62.95	1.913	1.000	13.93	.228
HUB	4.439	17.13	68.25	1.971	1.000	15.66	.248

TABLE IV. - OVERALL PERFORMANCE AT 100 PERCENT

OF DESIGN SPEED

(a) Two-stage fan

READING NUMBER.....	123	1140	1157	1168
TOTAL PRESSURE RATIO.....	2.372	2.208	2.276	2.045
TOTAL TEMPERATURE RATIO.....	1.366	1.323	1.336	1.300
ADIABATIC EFFICIENCY.....	.762	.784	.784	.752
POLYTROPIC EFFICIENCY.....	.789	.806	.807	.775
WEIGHT FLOW.....	30.49	32.60	32.23	32.81
WHEEL SPEED, RPM.....	16059.7	16004.4	16027.7	16040.6
PERCENT OF DESIGN SPEED.....	100.1	99.8	99.9	100.0
DELTA.....	.919	.912	.914	.912
THETA.....	.981	1.024	1.033	1.034

(b) First stage

READING NUMBER.....	123	1140	1157	1168
ROTOR TOTAL PRESSURE RATIO.....	1.600	1.514	1.542	1.504
STAGE TOTAL PRESSURE RATIO.....	1.564	1.489	1.516	1.479
ROTOR TOTAL TEMPERATURE RATIO.....	1.179	1.156	1.163	1.154
STAGE TOTAL TEMPERATURE RATIO.....	1.179	1.156	1.163	1.154
ROTOR ADIABATIC EFFICIENCY.....	.805	.804	.807	.800
STAGE ADIABATIC EFFICIENCY.....	.764	.771	.774	.765
ROTOR POLYTROPIC EFFICIENCY.....	.818	.815	.819	.811
STAGE POLYTROPIC EFFICIENCY.....	.778	.783	.787	.778
ROTOR HEAD RISE COEFFICIENT.....	.237	.208	.218	.204
STAGE HEAD RISE COEFFICIENT.....	.224	.200	.208	.195
FLOW COEFFICIENT.....	.403	.444	.436	.448
EQUIVALENT VALUES BASED ON STAGE INLET				
WEIGHT FLOW.....	30.54	32.64	32.26	32.85
WEIGHT FLOW PER UNIT ANNULUS AREA.....	179.38	191.69	189.49	192.94
WEIGHT FLOW PER UNIT FRONTAL AREA.....	150.68	161.02	159.17	162.06

(c) Second stage

READING NUMBER.....	123	1140	1157	1168
ROTOR TOTAL PRESSURE RATIO.....	1.557	1.511	1.531	1.410
STAGE TOTAL PRESSURE RATIO.....	1.516	1.482	1.502	1.383
ROTOR TOTAL TEMPERATURE RATIO.....	1.158	1.144	1.149	1.127
STAGE TOTAL TEMPERATURE RATIO.....	1.159	1.144	1.149	1.126
ROTOR ADIABATIC EFFICIENCY.....	.847	.867	.864	.813
STAGE ADIABATIC EFFICIENCY.....	.792	.824	.822	.765
ROTOR POLYTROPIC EFFICIENCY.....	.857	.874	.872	.822
STAGE POLYTROPIC EFFICIENCY.....	.803	.834	.832	.776
ROTOR HEAD RISE COEFFICIENT.....	.289	.265	.275	.217
STAGE HEAD RISE COEFFICIENT.....	.271	.252	.262	.204
FLOW COEFFICIENT.....	.429	.492	.474	.500
EQUIVALENT VALUES BASED ON STAGE INLET				
WEIGHT FLOW.....	21.20	23.57	22.95	23.87
WEIGHT FLOW PER UNIT ANNULUS AREA.....	166.38	184.97	180.18	187.37
WEIGHT FLOW PER UNIT FRONTAL AREA.....	115.90	128.86	125.52	130.53

TABLE V. - OVERALL PERFORMANCE AT 80 PERCENT

OF DESIGN SPEED

(a) Two-stage fan

READING NUMBER.....	136	159	172	183
TOTAL PRESSURE RATIO.....	1.588	1.739	1.764	1.767
TOTAL TEMPERATURE RATIO.....	1.177	1.210	1.237	1.226
ADIABATIC EFFICIENCY.....	.796	.813	.740	.779
POLYTROPIC EFFICIENCY.....	.809	.827	.760	.796
WEIGHT FLOW.....	26.67	24.34	20.88	22.41
WHEEL SPEED, RPM.....	12884.1	12871.8	12867.6	12875.2
PERCENT OF DESIGN SPEED.....	80.3	80.2	80.2	80.3
DELTA.....	.927	.933	.939	.936
THETA.....	.983	.988	1.007	1.009

(b) First stage

READING NUMBER.....	136	159	172	183
ROTOR TOTAL PRESSURE RATIO.....	1.323	1.353	1.373	1.367
STAGE TOTAL PRESSURE RATIO.....	1.310	1.337	1.344	1.345
ROTOR TOTAL TEMPERATURE RATIO.....	1.097	1.107	1.121	1.116
STAGE TOTAL TEMPERATURE RATIO.....	1.097	1.107	1.122	1.116
ROTOR ADIABATIC EFFICIENCY.....	.857	.839	.782	.809
STAGE ADIABATIC EFFICIENCY.....	.824	.806	.725	.764
ROTOR POLYTROPIC EFFICIENCY.....	.863	.846	.791	.817
STAGE POLYTROPIC EFFICIENCY.....	.831	.814	.736	.774
ROTOR HEAD RISE COEFFICIENT.....	.213	.231	.243	.239
STAGE HEAD RISE COEFFICIENT.....	.205	.222	.226	.226
FLOW COEFFICIENT.....	.422	.378	.318	.344
EQUIVALENT VALUES BASED ON STAGE INLET				
WEIGHT FLOW.....	26.70	24.36	20.89	22.43
WEIGHT FLOW PER UNIT ANNULUS AREA.....	156.81	143.07	122.72	131.75
WEIGHT FLOW PER UNIT FRONTAL AREA.....	131.72	120.18	103.09	110.66

(c) Second stage

READING NUMBER.....	136	159	172	183
ROTOR TOTAL PRESSURE RATIO.....	1.238	1.319	1.334	1.333
STAGE TOTAL PRESSURE RATIO.....	1.212	1.301	1.312	1.313
ROTOR TOTAL TEMPERATURE RATIO.....	1.073	1.093	1.103	1.099
STAGE TOTAL TEMPERATURE RATIO.....	1.073	1.093	1.103	1.099
ROTOR ADIABATIC EFFICIENCY.....	.862	.883	.835	.862
STAGE ADIABATIC EFFICIENCY.....	.775	.838	.781	.816
ROTOR POLYTROPIC EFFICIENCY.....	.866	.888	.841	.867
STAGE POLYTROPIC EFFICIENCY.....	.781	.844	.790	.823
ROTOR HEAD RISE COEFFICIENT.....	.195	.258	.273	.270
STAGE HEAD RISE COEFFICIENT.....	.175	.245	.257	.256
FLOW COEFFICIENT.....	.518	.454	.383	.412
EQUIVALENT VALUES BASED ON STAGE INLET				
WEIGHT FLOW.....	21.35	19.17	16.46	17.61
WEIGHT FLOW PER UNIT ANNULUS AREA.....	167.55	150.49	129.21	138.26
WEIGHT FLOW PER UNIT FRONTAL AREA.....	116.72	104.83	90.01	96.31

TABLE VI. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(a) 100 Percent of design speed; reading 123

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	.4	46.5	70.8	61.4	288.9	1.208	9.92	1.643
2	23.978	23.594	.6	45.4	68.1	59.7	288.5	1.200	10.13	1.619
3	22.537	22.250	1.4	44.2	65.1	56.2	288.7	1.184	10.12	1.621
4	21.092	20.907	.5	44.6	63.3	53.0	287.9	1.180	10.16	1.610
5	20.218	20.102	.5	46.1	62.0	51.3	288.0	1.178	10.16	1.589
6	19.342	19.294	.5	48.0	60.8	49.3	287.8	1.176	10.16	1.567
7	18.166	18.219	.3	49.2	59.3	45.4	287.8	1.172	10.16	1.553
8	15.133	15.532	.6	49.4	54.7	26.8	287.8	1.163	10.16	1.585
9	13.533	14.188	.9	50.2	52.1	12.8	288.0	1.163	10.16	1.609
10	11.854	12.845	1.0	53.1	49.1	-3.9	288.1	1.168	10.15	1.634
11	10.973	12.172	1.0	55.6	47.5	-12.5	288.4	1.169	10.15	1.604

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	144.7	205.3	439.4	295.4	144.7	141.3	.9	149.0	415.8	408.4
2	161.9	207.4	433.4	288.7	161.9	145.6	1.6	147.8	403.6	397.1
3	173.6	211.4	412.3	272.2	173.6	151.5	4.3	147.5	378.3	373.5
4	177.7	213.1	394.8	252.0	177.7	151.7	1.5	149.7	354.1	351.0
5	179.9	213.0	383.1	235.9	179.9	147.6	1.4	153.6	339.6	337.7
6	180.8	212.8	370.3	218.4	180.8	142.4	1.5	158.2	324.6	323.8
7	181.4	216.2	354.9	201.1	181.4	141.2	1.0	163.7	306.1	307.0
8	178.7	240.0	309.5	175.1	178.7	156.2	1.8	182.2	254.6	261.3
9	175.5	261.3	285.4	171.6	175.4	167.3	2.7	200.7	227.8	238.8
10	170.3	284.9	260.0	171.6	170.3	171.2	3.1	227.7	199.5	216.2
11	166.7	292.7	246.6	169.4	166.7	165.4	3.0	241.5	184.8	205.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.432	.565	1.313	.814	.432	.389	.976	1.558
2	.486	.574	1.302	.799	.486	.403	.899	1.500
3	.524	.590	1.243	.759	.523	.423	.873	1.430
4	.537	.597	1.193	.706	.537	.425	.854	1.423
5	.544	.597	1.159	.662	.544	.414	.820	1.410
6	.547	.597	1.121	.613	.547	.400	.787	1.402
7	.549	.609	1.074	.566	.549	.398	.779	1.405
8	.540	.684	.936	.499	.540	.446	.874	1.371
9	.530	.751	.862	.493	.530	.481	.954	1.306
10	.513	.826	.784	.498	.513	.496	1.005	1.221
11	.502	.851	.742	.492	.502	.481	.992	1.168

RP	PERCENT SPAN		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	6.2	3.9	3.0	.453	.734	.227	.148	.041	.027	
2	10.00	5.2	2.7	2.5	.456	.738	.220	.154	.041	.028	
3	20.00	5.1	2.0	2.1	.459	.803	.166	.121	.032	.023	
4	30.00	5.9	2.5	2.8	.483	.810	.165	.128	.032	.025	
5	36.00	6.2	2.6	3.8	.507	.797	.181	.149	.035	.029	
6	42.00	6.5	2.6	5.1	.536	.780	.203	.176	.039	.034	
7	50.00	7.1	2.9	6.4	.562	.779	.212	.189	.042	.037	
8	70.00	7.8	2.9	6.9	.574	.865	.153	.145	.032	.030	
9	80.00	7.7	2.8	6.3	.550	.892	.139	.137	.029	.028	
10	90.00	7.4	2.6	4.8	.508	.899	.156	.156	.029	.029	
11	95.00	7.1	2.6	4.1	.490	.858	.238	.238	.040	.040	

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(b) 100 Percent of design speed; reading 1140

RP	RADII		ABS BETAM		REL BETAM		TOTAL IN	EMP RATIO	TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT			IN	RATIO
1	24.704	24.265	-1.1	36.5	68.7	61.1	288.8	1.169	9.94	1.507
2	23.978	23.594	-1.5	35.2	66.3	59.8	288.5	1.163	10.13	1.491
3	22.537	22.250	-1.1	34.7	63.5	56.9	288.2	1.154	10.13	1.503
4	21.092	20.907	-1.6	36.4	61.5	54.6	288.0	1.152	10.15	1.484
5	20.218	20.102	-1.4	38.9	60.1	53.8	288.0	1.151	10.15	1.454
6	19.342	19.294	-1.4	41.4	58.9	52.8	287.9	1.150	10.15	1.425
7	18.166	18.219	-1.6	42.5	57.2	47.9	288.0	1.151	10.16	1.440
8	15.133	15.532	-1.1	42.7	52.7	27.1	288.0	1.154	10.15	1.579
9	13.533	14.188	-.8	44.7	50.1	15.0	288.0	1.156	10.15	1.604
10	11.854	12.845	-.6	48.4	47.1	-.7	288.2	1.163	10.15	1.608
11	10.973	12.172	-.5	49.4	45.5	-7.8	288.4	1.164	10.13	1.616

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	162.4	198.1	447.6	329.8	162.3	159.2	-3.0	117.9	414.1	406.8
2	178.5	199.6	443.9	324.4	178.4	163.1	-4.6	115.0	401.9	395.4
3	190.6	204.1	426.5	306.9	190.6	167.8	-3.6	116.2	378.0	373.2
4	195.2	202.7	408.4	281.9	195.1	163.1	-5.4	120.4	353.4	350.3
5	197.4	199.0	396.3	262.2	197.3	154.8	-5.0	125.1	338.7	336.8
6	198.5	196.2	384.6	243.5	198.5	147.2	-4.9	129.7	324.6	323.7
7	199.3	204.6	368.3	225.1	199.2	150.9	-5.5	138.2	304.2	305.1
8	196.2	246.9	323.6	203.7	196.1	181.4	-3.9	167.5	253.5	260.2
9	192.5	266.6	299.9	196.2	192.5	189.6	-2.8	187.4	227.2	238.2
10	186.6	290.7	273.9	192.9	186.6	192.9	-2.0	217.5	198.4	215.0
11	182.0	304.4	259.7	199.9	182.0	198.0	-1.5	231.1	183.8	203.9

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.488	.554	1.345	.923	.488	.445	.981	1.518
2	.539	.560	1.341	.911	.539	.458	.914	1.476
3	.578	.576	1.294	.867	.578	.474	.880	1.420
4	.594	.573	1.242	.797	.593	.461	.836	1.403
5	.601	.562	1.206	.741	.601	.437	.784	1.385
6	.605	.554	1.171	.688	.604	.416	.741	1.376
7	.607	.579	1.122	.637	.607	.427	.758	1.366
8	.597	.709	.984	.585	.597	.521	.925	1.372
9	.585	.771	.911	.568	.585	.548	.985	1.317
10	.566	.847	.830	.562	.566	.562	1.034	1.237
11	.550	.893	.786	.586	.550	.581	1.088	1.184

RP	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	4.1	1.9	2.7	.364	.735	.188	.113	.034	.021
2	10.00	3.4	1.0	2.6	.367	.741	.180	.113	.033	.021
3	20.00	3.4	.4	2.8	.377	.801	.139	.089	.026	.017
4	30.00	4.1	.7	4.4	.409	.784	.156	.116	.029	.022
5	36.00	4.4	.7	6.4	.440	.746	.188	.154	.035	.028
6	42.00	4.7	.8	8.6	.471	.709	.221	.192	.040	.035
7	50.00	5.1	.9	8.9	.498	.725	.223	.200	.042	.038
8	70.00	5.7	.8	7.1	.497	.906	.095	.084	.020	.018
9	80.00	5.7	.8	8.4	.483	.926	.085	.081	.017	.017
10	90.00	5.4	.6	7.9	.451	.893	.148	.148	.028	.028
11	9 5.00	5.2	.7	8.6	.394	.899	.153	.153	.026	.026

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(c) 100 Percent of design speed; reading 1157

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	-1.3	38.8	69.2	60.9	288.8	1.182	9.94	1.557
2	23.978	23.594	-1.6	37.5	66.7	59.4	288.5	1.176	10.13	1.538
3	22.537	22.250	-1.2	36.8	63.9	56.7	288.3	1.164	10.13	1.544
4	21.092	20.907	-1.8	38.3	61.9	54.4	287.9	1.161	10.15	1.521
5	20.218	20.102	-1.6	40.8	60.6	53.5	288.0	1.159	10.15	1.492
6	19.342	19.294	-1.6	43.0	59.4	52.3	288.1	1.158	10.15	1.467
7	18.166	18.219	-1.8	44.3	57.8	47.8	287.9	1.158	10.15	1.470
8	15.133	15.532	-1.3	44.4	53.3	27.8	288.0	1.156	10.15	1.584
9	13.533	14.188	-1.0	45.9	50.6	15.5	288.0	1.157	10.15	1.607
10	11.854	12.845	-.6	49.9	47.6	-1.0	288.1	1.164	10.15	1.617
11	10.973	12.172	-.3	51.4	46.0	-8.7	288.4	1.164	10.13	1.617

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	159.4	201.6	448.6	322.8	159.4	157.1	-3.6	126.3	415.7	408.3
2	175.6	203.0	443.8	316.6	175.5	160.9	-4.9	123.7	402.7	396.3
3	187.5	206.2	426.6	300.5	187.5	165.2	-3.9	123.4	379.3	374.4
4	191.9	204.2	407.7	275.4	191.8	160.2	-5.9	126.6	353.8	350.7
5	194.1	201.1	395.8	256.3	194.1	152.3	-5.5	131.3	339.5	337.5
6	195.3	198.9	383.2	237.5	195.2	145.3	-5.3	135.7	324.4	323.6
7	196.0	205.3	367.2	218.8	195.9	146.9	-6.0	143.4	304.6	305.5
8	192.8	242.0	322.2	195.5	192.7	172.9	-4.3	169.4	253.8	260.5
9	189.2	261.2	297.8	188.6	189.2	181.8	-3.2	187.5	226.8	237.8
10	183.4	285.6	271.9	184.0	183.4	184.0	-1.9	218.4	198.8	215.4
11	178.6	297.9	257.1	188.2	178.5	186.0	-1.0	232.6	184.0	204.1

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.478	.561	1.346	.899	.478	.437	.986	1.535
2	.530	.567	1.339	.885	.530	.450	.917	1.488
3	.568	.580	1.293	.846	.568	.465	.881	1.435
4	.583	.575	1.238	.776	.583	.451	.835	1.416
5	.590	.567	1.203	.722	.590	.429	.785	1.400
6	.594	.560	1.165	.669	.594	.409	.744	1.387
7	.596	.580	1.117	.618	.596	.415	.750	1.381
8	.586	.693	.979	.560	.586	.495	.897	1.384
9	.574	.753	.904	.544	.574	.524	.961	1.322
10	.555	.830	.823	.535	.555	.535	1.003	1.241
11	.539	.870	.777	.550	.539	.543	1.042	1.184

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	4.6	2.3	2.5	.388	.741	.195	.116	.036	.021	
2	10.00	3.8	1.4	2.2	.392	.746	.188	.119	.035	.022	
3	20.00	3.9	.9	2.6	.398	.806	.143	.090	.027	.017	
4	30.00	4.6	1.2	4.2	.429	.793	.157	.115	.030	.022	
5	36.00	4.9	1.2	6.1	.459	.761	.186	.151	.034	.028	
6	42.00	5.1	1.3	8.1	.490	.734	.213	.183	.039	.033	
7	50.00	5.6	1.4	8.8	.519	.738	.221	.198	.042	.037	
8	70.00	6.3	1.4	7.8	.522	.900	.103	.091	.022	.019	
9	80.00	6.2	1.2	8.9	.506	.927	.085	.082	.017	.017	
10	90.00	5.9	1.1	7.7	.481	.899	.142	.142	.027	.026	
11	95.00	5.7	1.2	7.8	.434	.896	.161	.161	.026	.028	

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(d) 100 Percent of design speed; reading 1168

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	-1.1	35.3	68.7	61.0	288.7	1.166	9.94	1.493
2	23.978	23.594	-1.3	34.3	66.1	59.8	288.6	1.159	10.13	1.473
3	22.537	22.250	-.9	33.8	63.3	57.0	288.3	1.150	10.14	1.486
4	21.092	20.907	-1.3	35.8	61.2	54.8	288.0	1.149	10.15	1.468
5	20.218	20.102	-1.2	38.3	59.8	53.9	288.0	1.148	10.15	1.437
6	19.342	19.294	-1.2	40.7	58.6	52.9	288.0	1.147	10.15	1.407
7	18.166	18.219	-1.4	42.0	57.0	48.0	288.0	1.150	10.16	1.424
8	15.133	15.532	-1.1	42.2	52.5	26.8	287.9	1.154	10.15	1.579
9	13.533	14.188	-.8	44.1	49.8	14.7	287.9	1.157	10.15	1.607
10	11.854	12.845	-.6	47.7	46.9	-.5	288.1	1.163	10.15	1.611
11	10.973	12.172	-.4	48.6	45.3	-7.6	288.3	1.164	10.13	1.621

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	163.5	198.9	449.2	335.0	163.5	162.4	-3.0	115.0	415.4	408.0
2	180.2	199.8	445.3	328.6	180.2	165.1	-4.1	112.5	403.1	396.7
3	192.6	203.7	427.9	310.9	192.5	169.3	-3.2	113.3	378.9	374.1
4	197.1	202.9	409.7	285.3	197.1	164.6	-4.5	118.5	354.7	351.6
5	199.5	198.8	397.0	264.8	199.4	156.1	-4.1	123.2	339.1	337.2
6	200.7	195.4	384.9	245.7	200.6	148.1	-4.2	127.5	324.3	323.5
7	201.4	204.5	369.3	227.3	201.3	152.1	-4.9	136.7	304.8	305.7
8	198.1	249.5	325.3	207.3	198.1	185.0	-3.7	167.5	254.3	261.0
9	194.4	269.8	301.4	200.5	194.4	193.9	-2.8	187.6	227.5	238.5
10	188.4	294.3	275.6	198.0	188.4	197.9	-1.9	217.7	199.2	215.9
11	183.7	308.5	261.0	205.7	183.7	203.9	-1.3	231.5	184.1	204.2

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.491	.558	1.350	.939	.491	.455	.993	1.521
2	.545	.562	1.346	.924	.544	.464	.916	1.474
3	.585	.576	1.299	.880	.585	.479	.879	1.418
4	.600	.574	1.247	.808	.600	.466	.835	1.400
5	.607	.562	1.209	.749	.607	.441	.783	1.378
6	.611	.552	1.173	.695	.611	.419	.738	1.366
7	.614	.579	1.126	.644	.614	.431	.756	1.360
8	.603	.717	.991	.596	.603	.532	.934	1.374
9	.591	.781	.916	.581	.591	.562	.998	1.318
10	.571	.859	.836	.578	.571	.578	1.051	1.240
11	.556	.907	.790	.605	.556	.599	1.110	1.184

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	4.0	1.8	2.6	.352	.733	.185	.108	.034	.020
2	10.00	3.3	.8	2.6	.357	.735	.180	.113	.033	.021
3	20.00	3.2	.2	3.0	.367	.798	.138	.087	.026	.016
4	30.00	3.9	.5	4.5	.400	.777	.158	.117	.029	.022
5	36.00	4.1	.4	5.4	.432	.736	.192	.159	.035	.029
6	42.00	4.4	.5	8.8	.464	.696	.227	.199	.041	.036
7	50.00	4.8	.6	9.0	.492	.711	.231	.209	.043	.039
8	70.00	5.5	.6	6.8	.489	.904	.096	.084	.020	.018
9	80.00	5.5	.5	8.1	.472	.927	.083	.079	.017	.016
10	90.00	5.2	.4	8.1	.437	.893	.146	.145	.027	.027
11	95.00	4.9	.4	8.8	.374	.903	.146	.146	.025	.025

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(e) 80 Percent of design speed; reading 136

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	2.0	36.5	69.8	62.0	289.6	1.099	9.97	1.300
2	23.978	23.594	1.3	34.7	67.0	60.0	289.0	1.097	10.12	1.296
3	22.537	22.250	.5	33.0	64.2	56.8	288.1	1.092	10.15	1.300
4	21.092	20.907	.4	34.4	62.2	53.6	287.9	1.091	10.15	1.303
5	20.218	20.102	.6	36.7	60.9	51.3	287.8	1.094	10.15	1.301
6	19.342	19.294	.7	39.3	59.7	48.8	287.8	1.096	10.15	1.298
7	18.166	18.219	.7	41.3	58.0	43.8	287.8	1.099	10.15	1.302
8	15.133	15.532	1.1	42.7	53.3	25.9	287.9	1.097	10.15	1.352
9	13.533	14.188	1.4	44.7	50.5	13.1	287.9	1.100	10.15	1.369
10	11.854	12.845	1.7	48.5	47.4	-3.6	288.1	1.107	10.15	1.399
11	10.973	12.172	1.7	49.9	45.9	-10.7	288.1	1.109	10.14	1.402

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	121.3	155.6	350.8	266.2	121.2	125.1	4.3	92.6	333.5	327.6
2	135.9	160.0	348.2	262.6	135.9	131.4	3.1	91.2	323.7	318.5
3	146.5	164.4	336.1	251.5	146.5	137.9	1.3	89.6	303.8	300.0
4	149.4	167.4	320.5	232.7	149.4	138.1	1.0	94.7	284.5	282.0
5	151.0	169.6	310.5	217.6	151.0	135.9	1.5	101.4	272.8	271.2
6	151.8	172.0	300.9	202.1	151.8	133.1	1.8	108.9	261.5	260.9
7	152.2	178.4	287.2	185.6	152.2	134.0	1.9	117.8	245.5	246.2
8	150.0	202.5	251.0	165.5	150.0	148.9	2.9	137.2	204.2	209.6
9	147.3	219.9	231.4	160.5	147.2	156.3	3.7	154.7	182.3	191.1
10	142.9	244.2	211.0	152.2	142.8	161.9	4.2	182.9	159.5	172.8
11	139.7	255.3	200.5	167.3	139.6	164.4	4.2	195.4	148.1	164.3

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.360	.444	1.042	.759	.360	.357	1.032	1.310
2	.405	.458	1.038	.751	.405	.376	.967	1.255
3	.439	.473	1.007	.723	.439	.396	.941	1.229
4	.448	.482	.961	.670	.448	.397	.924	1.214
5	.453	.488	.931	.626	.453	.391	.900	1.192
6	.455	.495	.903	.581	.455	.383	.877	1.175
7	.457	.514	.862	.534	.457	.386	.881	1.146
8	.450	.587	.753	.480	.450	.432	.993	1.065
9	.441	.641	.693	.468	.441	.456	1.061	1.013
10	.427	.716	.631	.476	.427	.475	1.133	.947
11	.418	.752	.599	.493	.417	.484	1.178	.911

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	TOT				PROF	TOT	PROF	
1	5.00	5.2	2.9	3.6	.335	.785	.130	.120	.023	.021	
2	10.00	4.2	1.7	2.8	.337	.796	.122	.116	.022	.021	
3	20.00	4.1	1.1	2.7	.342	.850	.090	.086	.017	.016	
4	30.00	4.9	1.5	3.4	.368	.861	.089	.087	.017	.017	
5	36.00	5.1	1.5	3.9	.399	.835	.113	.112	.022	.022	
6	42.00	5.5	1.6	4.6	.434	.803	.144	.144	.028	.028	
7	50.00	5.8	1.6	4.8	.467	.797	.163	.163	.033	.033	
8	70.00	6.3	1.4	5.9	.469	.925	.075	.075	.016	.016	
9	80.00	6.2	1.2	6.6	.449	.938	.072	.072	.015	.015	
10	90.00	5.7	.9	5.1	.396	.940	.088	.088	.016	.016	
11	95.00	5.5	1.0	5.8	.340	.932	.110	.110	.019	.019	

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(f) 80 Percent of design speed; reading 159

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	2.1	43.4	71.8	62.7	289.6	1.116	9.99	1.354
2	23.978	23.594	1.2	41.9	69.3	61.1	289.0	1.113	10.12	1.341
3	22.537	22.250	.1	39.6	66.6	58.2	288.1	1.105	10.14	1.341
4	21.092	20.907	.1	41.3	64.8	55.3	287.9	1.104	10.15	1.335
5	20.218	20.102	.3	43.8	63.6	52.8	287.8	1.106	10.15	1.335
6	19.342	19.294	.4	45.8	62.4	49.8	287.8	1.108	10.15	1.335
7	18.166	18.219	.4	47.4	60.8	44.3	287.8	1.109	10.15	1.340
8	15.133	15.532	.8	47.1	56.4	25.9	287.8	1.103	10.15	1.362
9	13.533	14.188	1.2	48.2	53.7	12.7	288.0	1.104	10.15	1.378
10	11.854	12.845	1.5	51.9	50.7	-5.3	288.0	1.110	10.14	1.405
11	10.973	12.172	1.6	53.7	49.1	-13.1	288.2	1.110	10.14	1.396

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	108.5	156.3	346.4	247.3	108.5	113.6	4.0	107.3	333.0	327.1
2	121.6	157.7	343.2	243.2	121.6	117.4	2.5	105.3	323.4	318.3
3	131.2	159.2	329.9	232.7	131.2	122.7	.3	101.4	303.0	299.1
4	133.8	161.7	314.1	213.1	133.8	121.4	.1	106.7	284.3	281.8
5	135.1	165.0	303.5	196.9	135.1	119.1	.8	114.1	272.5	271.0
6	135.8	168.9	293.4	182.3	135.8	117.7	1.0	121.2	261.0	260.4
7	136.3	176.2	279.6	166.6	136.3	119.3	1.0	129.6	245.1	245.9
8	134.4	196.7	242.6	149.0	134.4	133.9	1.9	144.1	203.9	209.3
9	132.0	213.8	223.0	146.1	131.9	142.6	2.8	159.3	182.5	191.4
10	128.0	237.4	201.9	147.2	127.9	146.6	3.5	186.7	159.7	173.1
11	124.9	245.6	190.9	149.4	124.9	145.5	3.6	197.8	147.9	164.1

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.321	.442	1.026	.700	.321	.321	1.047	1.374
2	.361	.447	1.020	.690	.361	.333	.966	1.329
3	.391	.454	.984	.664	.391	.350	.935	1.297
4	.400	.462	.938	.609	.400	.347	.907	1.273
5	.404	.471	.907	.563	.404	.340	.882	1.247
6	.406	.483	.877	.521	.406	.336	.866	1.226
7	.407	.504	.836	.477	.407	.341	.875	1.194
8	.401	.568	.725	.430	.401	.387	.997	1.101
9	.394	.621	.665	.424	.394	.414	1.081	1.045
10	.381	.693	.602	.430	.381	.428	1.146	.971
11	.372	.719	.569	.438	.372	.426	1.165	.927

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	7.2	4.9	4.2	.397	.779	.157	.142	.027	.025	
2	10.00	6.4	3.9	3.9	.400	.778	.155	.145	.027	.026	
3	20.00	6.5	3.5	4.1	.399	.836	.114	.108	.021	.020	
4	30.00	7.4	4.0	5.0	.431	.828	.127	.124	.023	.023	
5	36.00	7.8	4.2	5.3	.467	.810	.150	.149	.028	.028	
6	42.00	8.2	4.3	5.6	.501	.796	.172	.171	.033	.033	
7	50.00	8.6	4.4	5.2	.533	.799	.185	.185	.037	.037	
8	70.00	9.4	4.5	6.0	.526	.896	.115	.115	.024	.024	
9	80.00	9.4	4.4	6.1	.497	.928	.093	.093	.019	.019	
10	90.00	9.0	4.3	3.4	.448	.930	.114	.114	.021	.021	
11	95.00	8.8	4.3	3.5	.404	.907	.166	.166	.028	.028	

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(g) 80 Percent of design speed; reading 172

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	1.6	52.9	74.8	65.3	289.5	1.136	10.02	1.388
2	23.978	23.594	.8	53.0	72.4	64.1	288.8	1.135	10.12	1.373
3	22.537	22.250	.1	52.0	70.0	60.6	288.1	1.130	10.14	1.370
4	21.092	20.907	.1	52.4	68.4	56.9	287.9	1.125	10.14	1.367
5	20.218	20.102	.2	53.6	67.4	54.6	287.8	1.124	10.14	1.362
6	19.342	19.294	.1	54.7	66.4	51.4	287.9	1.123	10.14	1.359
7	18.166	18.219	.2	55.1	64.9	45.5	288.0	1.121	10.14	1.358
8	15.133	15.532	.3	51.4	61.0	25.2	287.8	1.110	10.14	1.366
9	13.533	14.188	.7	51.0	58.6	10.8	287.9	1.109	10.14	1.391
10	11.854	12.845	1.2	53.7	55.7	-5.8	287.9	1.111	10.14	1.401
11	10.973	12.172	1.5	56.4	54.2	-14.6	288.1	1.111	10.14	1.384

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	89.9	154.8	341.8	223.4	89.8	93.5	2.4	123.4	332.2	326.3
2	102.0	156.0	337.0	214.6	102.0	93.9	1.5	124.6	322.7	317.6
3	110.4	159.3	322.4	199.5	110.4	98.0	.1	125.5	303.1	299.2
4	112.3	163.0	305.6	182.4	112.3	99.5	.2	129.0	284.4	281.9
5	113.4	165.6	295.1	169.4	113.4	98.2	.5	133.3	272.9	271.3
6	114.0	168.8	284.4	156.6	114.0	97.6	.3	137.7	260.8	260.1
7	114.4	174.9	269.7	142.9	114.4	100.2	.3	143.4	244.5	245.2
8	112.8	194.6	232.3	134.1	112.8	121.3	.7	152.1	203.8	209.2
9	110.8	213.6	212.5	137.0	110.8	134.6	1.4	165.9	182.7	191.5
10	107.6	232.3	190.7	138.3	107.5	137.6	2.3	187.1	159.8	173.2
11	105.0	238.5	179.3	136.5	105.0	132.1	2.7	198.6	148.0	164.2

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.265	.434	1.009	.626	.265	.262	1.041	1.473
2	.302	.438	.998	.603	.302	.264	.921	1.432
3	.328	.449	.958	.563	.328	.277	.888	1.377
4	.334	.461	.908	.516	.334	.282	.887	1.348
5	.337	.469	.877	.480	.337	.278	.866	1.322
6	.339	.479	.845	.444	.339	.277	.856	1.296
7	.340	.497	.802	.406	.340	.285	.876	1.257
8	.335	.560	.691	.386	.335	.349	1.076	1.157
9	.329	.619	.631	.397	.329	.390	1.214	1.095
10	.319	.677	.566	.403	.319	.401	1.280	1.010
11	.312	.697	.532	.399	.312	.386	1.258	.958

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS					TOT	PROF	TOT	PROF
1	5.00	10.2	8.0	6.8	.478	.723	.228	.203	.036	.032	
2	10.00	9.5	7.1	6.9	.496	.703	.246	.228	.039	.036	
3	20.00	9.9	6.9	6.5	.515	.725	.236	.226	.040	.038	
4	30.00	11.1	7.7	6.7	.539	.745	.230	.225	.041	.040	
5	36.00	11.6	8.0	7.1	.565	.743	.242	.240	.044	.043	
6	42.00	12.1	8.2	7.3	.593	.742	.256	.255	.048	.047	
7	50.00	12.7	8.5	6.5	.619	.754	.261	.261	.051	.051	
8	70.00	14.0	9.1	5.2	.579	.851	.187	.187	.040	.040	
9	80.00	14.2	9.3	4.2	.523	.911	.131	.131	.027	.027	
10	90.00	14.0	9.2	2.9	.463	.915	.154	.154	.029	.029	
11	95.00	13.8	9.3	1.9	.439	.877	.250	.250	.042	.042	

TABLE VI. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(h) 80 Percent of design speed; reading 183

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	24.704	24.265	1.8	47.9	73.5	63.8	289.7	1.126	10.01	1.380
2	23.978	23.594	1.0	47.7	71.0	62.4	288.9	1.125	10.12	1.365
3	22.537	22.250	.0	46.5	68.6	59.8	288.1	1.118	10.14	1.359
4	21.092	20.907	.2	47.9	66.9	56.3	287.9	1.116	10.14	1.356
5	20.218	20.102	.3	49.6	65.7	53.7	288.0	1.117	10.14	1.354
6	19.342	19.294	.3	51.3	64.5	50.6	287.9	1.117	10.14	1.351
7	18.166	18.219	.3	52.2	63.1	45.0	287.9	1.117	10.14	1.354
8	15.133	15.532	.6	49.7	58.9	25.1	287.8	1.107	10.14	1.366
9	13.533	14.188	1.0	49.8	56.4	11.3	287.9	1.107	10.14	1.390
10	11.854	12.845	1.4	52.9	53.4	-5.4	287.9	1.110	10.14	1.401
11	10.973	12.172	1.5	55.5	51.8	-14.1	288.1	1.111	10.14	1.386

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	97.9	155.8	344.9	236.5	97.9	104.4	3.2	115.7	333.9	327.9
2	110.5	156.6	339.5	227.9	110.5	105.4	2.0	115.8	322.9	317.8
3	119.4	157.6	327.0	215.6	119.4	108.5	.1	114.3	304.6	300.7
4	121.6	161.6	309.4	195.4	121.6	108.4	.5	119.9	285.0	282.5
5	122.8	164.6	298.2	180.3	122.8	106.6	.6	125.4	272.3	270.7
6	123.5	168.1	287.2	165.7	123.5	105.2	.6	131.2	259.9	259.3
7	123.9	174.8	273.6	151.5	123.9	107.1	.6	138.2	244.6	245.3
8	122.2	196.0	236.4	139.9	122.1	126.7	1.3	149.6	203.6	209.0
9	120.0	214.6	216.9	141.3	120.0	138.5	2.1	163.9	182.8	191.7
10	116.5	234.0	195.5	141.8	116.4	141.2	2.8	186.5	159.9	173.2
11	114.0	240.8	184.4	140.7	113.9	136.5	3.0	198.3	148.0	164.2

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.289	.439	1.019	.666	.289	.294	1.067	1.433
2	.328	.442	1.007	.643	.328	.297	.954	1.387
3	.355	.447	.973	.611	.355	.308	.909	1.352
4	.362	.459	.921	.555	.362	.308	.891	1.317
5	.366	.468	.888	.512	.366	.303	.868	1.287
6	.368	.478	.856	.471	.368	.299	.852	1.258
7	.369	.498	.815	.432	.369	.305	.865	1.228
8	.364	.565	.704	.403	.364	.365	1.037	1.130
9	.357	.623	.646	.410	.357	.402	1.155	1.073
10	.346	.683	.582	.414	.346	.412	1.213	.992
11	.339	.704	.548	.411	.339	.399	1.198	.943

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS					TOT	PROF	TOT	PROF
1	5.00	8.9	6.7	5.4	.436	.764	.181	.161	.030	.027	
2	10.00	8.1	5.7	5.2	.450	.746	.197	.182	.033	.031	
3	20.00	8.5	5.5	5.7	.460	.773	.177	.168	.031	.029	
4	30.00	9.5	6.1	6.1	.493	.782	.181	.177	.033	.032	
5	36.00	9.9	6.3	6.3	.525	.775	.199	.197	.037	.036	
6	42.00	10.3	6.4	6.4	.558	.766	.219	.219	.041	.041	
7	50.00	10.9	6.7	6.0	.588	.775	.226	.226	.045	.045	
8	70.00	11.9	7.0	5.1	.558	.867	.159	.159	.034	.034	
9	80.00	12.1	7.1	4.8	.511	.923	.108	.108	.022	.022	
10	90.00	11.8	7.0	3.3	.457	.920	.138	.138	.026	.026	
11	95.00	11.5	7.0	2.5	.431	.883	.225	.225	.038	.038	

TABLE VII. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(a) 100 Percent of design speed; reading 123

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	42.9	3.1	42.9	3.1	349.0	1.000	16.30	.981
2	23.167	23.200	41.6	2.3	41.6	2.3	346.2	1.000	16.40	.979
3	21.981	22.068	40.2	2.3	40.2	2.3	341.9	1.000	16.40	.984
4	20.787	20.927	40.6	2.0	40.6	2.0	339.7	1.000	16.35	.982
5	20.071	20.244	42.2	1.8	42.2	1.8	339.1	1.000	16.14	.980
6	19.350	19.558	44.2	-.2	44.2	-.2	338.4	1.000	15.92	.978
7	18.387	18.649	45.5	-.5	45.5	-.5	337.4	1.000	15.78	.984
8	15.961	16.388	46.1	.8	46.1	.8	334.7	1.000	16.10	.982
9	14.752	15.263	47.5	2.7	47.5	2.7	335.0	1.000	16.35	.976
10	13.492	14.143	51.5	6.0	51.5	6.0	336.4	1.000	16.59	.947
11	12.868	13.586	55.0	-.9	55.0	-.9	337.0	1.000	16.27	.934

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	223.3	166.6	223.3	166.6	163.5	166.4	152.2	9.0	.0	.0
2	226.8	168.1	226.8	168.1	169.7	168.0	150.5	6.8	.0	.0
3	231.1	170.5	231.1	170.5	176.4	170.3	149.3	6.7	.0	.0
4	231.2	167.0	231.2	167.0	175.5	166.9	150.5	5.8	.0	.0
5	229.0	159.9	229.0	159.9	169.6	159.9	153.8	5.0	.0	.0
6	226.4	152.3	226.4	152.3	162.4	152.3	157.8	-.5	.0	.0
7	227.6	149.5	227.6	149.5	159.6	149.5	162.2	-1.2	.0	.0
8	245.9	160.5	245.9	160.5	170.4	160.5	177.3	2.4	.0	.0
9	262.3	167.0	262.3	167.0	177.4	166.8	193.3	7.7	.0	.0
10	276.9	160.3	276.9	160.3	172.2	159.4	216.8	16.9	.0	.0
11	278.9	140.6	278.9	140.6	160.0	140.6	228.4	-2.1	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.619	.454	.619	.454	.453	.453	1.018	.940
2	.632	.460	.632	.460	.473	.460	.990	.918
3	.649	.470	.649	.470	.496	.470	.965	.896
4	.652	.462	.652	.462	.495	.461	.951	.893
5	.646	.442	.646	.442	.478	.442	.942	.908
6	.639	.420	.639	.420	.458	.420	.938	.927
7	.643	.413	.643	.413	.451	.413	.937	.941
8	.703	.446	.703	.446	.487	.446	.942	.976
9	.755	.465	.755	.465	.510	.464	.940	1.033
10	.800	.445	.800	.445	.497	.442	.926	1.151
11	.806	.388	.806	.388	.462	.388	.879	1.225

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	8.7	2.7		17.9	.500	.000	.083	.083	.032	.032
2	10.00	7.5	1.5		15.1	.496	.000	.089	.089	.033	.033
3	20.00	6.2	.3		13.2	.481	.000	.065	.065	.023	.023
4	30.00	6.3	.4		12.2	.487	.000	.071	.071	.024	.024
5	36.00	7.4	1.6		11.6	.512	.000	.080	.080	.026	.026
6	42.00	8.6	2.9		9.5	.546	.000	.090	.090	.028	.028
7	50.00	8.8	3.1		9.1	.556	.000	.066	.066	.020	.020
8	70.00	5.9	.5		10.7	.530	.000	.066	.066	.017	.017
9	80.00	4.8	-.5		13.3	.531	.000	.075	.075	.018	.018
10	90.00	5.9	.8		18.6	.577	.000	.155	.155	.034	.034
11	95.00	7.8	2.8		13.2	.666	.000	.189	.189	.040	.040

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(b) 100 Percent of design speed; reading 1140

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	32.9	1.5	32.9	1.5	337.7	1.000	14.98	.985
2	23.167	23.200	31.4	.7	31.4	.7	335.5	1.000	15.10	.989
3	21.981	22.068	30.8	-.6	30.8	-.6	332.6	1.000	15.23	.990
4	20.787	20.927	32.5	-.5	32.5	-.5	331.8	1.000	15.07	.990
5	20.071	20.244	35.0	-.3	35.0	-.3	331.6	1.000	14.76	.990
6	19.350	19.558	37.5	-1.5	37.5	-1.5	331.2	1.000	14.47	.989
7	18.387	18.649	38.6	-1.4	38.6	-1.4	331.6	1.000	14.62	.983
8	15.961	16.388	39.2	.4	39.2	.4	332.3	1.000	16.03	.981
9	14.732	15.263	41.7	.6	41.7	.6	332.9	1.000	16.29	.984
10	13.492	14.143	46.8	1.7	46.8	1.7	335.1	1.000	16.32	.969
11	12.868	13.586	48.8	-.6	48.8	-.6	335.5	1.000	16.36	.927

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	221.6	175.8	221.6	175.8	186.0	175.7	120.4	4.5	.0	.0
2	225.1	181.4	225.1	181.4	192.2	181.4	117.1	2.1	.0	.0
3	229.8	186.1	229.8	186.1	197.5	186.1	117.6	-2.1	.0	.0
4	225.5	180.8	225.5	180.8	190.2	180.8	121.1	-1.5	.0	.0
5	218.2	171.8	218.2	171.8	178.7	171.8	125.3	-1.0	.0	.0
6	212.3	163.1	212.3	163.1	168.3	163.1	129.3	-4.4	.0	.0
7	219.3	165.4	219.3	165.4	171.4	165.3	136.9	-4.0	.0	.0
8	258.2	196.9	258.2	196.9	200.2	196.9	163.0	1.5	.0	.0
9	271.4	209.7	271.4	209.7	202.7	209.7	180.5	2.4	.0	.0
10	284.1	207.4	284.1	207.4	194.6	207.4	207.0	6.1	.0	.0
11	290.4	191.2	290.4	191.2	191.2	191.2	218.6	-1.9	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.625	.489	.625	.489	.524	.488	.945	.674
2	.637	.507	.637	.507	.544	.507	.944	.637
3	.655	.523	.655	.523	.563	.523	.942	.655
4	.643	.508	.643	.508	.542	.508	.950	.643
5	.620	.481	.620	.481	.508	.481	.961	.652
6	.603	.456	.603	.456	.478	.456	.969	.693
7	.624	.463	.624	.463	.487	.463	.965	.721
8	.745	.555	.745	.555	.578	.555	.983	.766
9	.787	.593	.787	.593	.588	.593	1.034	.844
10	.825	.584	.825	.584	.565	.584	1.066	1.001
11	.846	.536	.846	.536	.557	.536	1.000	1.058

RP	PERCENT SPAN		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	-2.9	-8.8		14.8	.407	.000	.067	.067	.026	.026
2	10.00	-4.2	-10.2		12.0	.385	.000	.047	.047	.017	.017
3	20.00	-4.8	-10.7		8.8	.375	.000	.041	.041	.014	.014
4	0.00	-3.4	-9.2		8.2	.380	.000	.041	.041	.014	.014
5	36.00	-1.3	-7.1		8.0	.400	.000	.045	.045	.015	.015
6	42.00	.5	-5.3		6.7	.428	.000	.052	.052	.016	.016
7	50.00	.4	-5.2		6.6	.436	.000	.074	.074	.022	.022
8	70.00	-2.5	-8.0		8.8	.398	.000	.061	.061	.016	.016
9	80.00	-2.5	-7.8		9.8	.383	.000	.049	.049	.012	.012
10	90.00	-.3	-5.5		12.7	.423	.000	.087	.087	.019	.019
11	95.00	.2	-4.9		12.0	.498	.000	.195	.195	.041	.041

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES
FOR FIRST-STAGE STATOR

(c) 100 Percent of design speed; reading 1157

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	35.1	2.6	35.1	2.6	341.4	1.000	15.48	.983
2	23.167	23.200	33.6	1.6	33.6	1.6	339.1	1.000	15.59	.986
3	21.981	22.068	32.8	.0	32.8	.0	335.5	1.000	15.65	.988
4	20.787	20.927	34.3	.4	34.3	.4	334.2	1.000	15.45	.989
5	20.071	20.244	36.8	.5	36.8	.5	333.9	1.000	15.15	.989
6	19.350	19.558	39.2	-1.0	39.2	-1.0	333.5	1.000	14.89	.986
7	18.387	18.649	40.5	-1.2	40.5	-1.2	333.3	1.000	14.93	.986
8	15.961	16.388	40.9	.6	40.9	.6	332.9	1.000	16.09	.984
9	14.732	15.263	43.0	.7	43.0	.7	333.1	1.000	16.32	.982
10	13.492	14.143	48.3	2.5	48.3	2.5	335.3	1.000	16.42	.965
11	12.868	13.586	50.7	-.4	50.7	-.4	335.8	1.000	16.38	.929

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	224.1	175.6	224.1	175.6	183.3	175.5	129.0	7.9	.0	.0
2	227.4	180.1	227.4	180.1	189.3	180.1	126.0	5.2	.0	.0
3	230.7	183.1	230.7	183.1	194.0	183.1	124.9	.1	.0	.0
4	225.7	177.1	225.7	177.1	186.4	177.1	127.4	1.1	.0	.0
5	219.4	168.1	219.4	168.1	175.6	168.1	131.5	1.6	.0	.0
6	214.2	159.4	214.2	159.4	166.0	159.4	135.3	-2.8	.0	.0
7	218.9	160.6	218.9	160.6	166.5	160.6	142.1	-3.3	.0	.0
8	251.6	186.2	251.6	186.2	190.1	186.2	164.8	2.0	.0	.0
9	265.0	196.6	265.0	196.6	193.9	196.6	180.6	2.4	.0	.0
10	278.7	192.8	278.7	192.8	185.5	192.7	208.0	8.5	.0	.0
11	284.2	174.4	284.2	174.4	179.9	174.4	220.1	-1.2	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.629	.485	.629	.485	.514	.485	.957	.740
2	.641	.500	.641	.500	.534	.500	.951	.691
3	.655	.512	.655	.512	.551	.512	.944	.655
4	.641	.495	.641	.495	.529	.495	.950	.657
5	.622	.469	.622	.469	.498	.469	.957	.708
6	.606	.444	.606	.444	.470	.444	.960	.735
7	.621	.448	.621	.448	.472	.448	.964	.760
8	.723	.523	.723	.523	.546	.523	.979	.812
9	.766	.554	.766	.554	.560	.554	1.014	.866
10	.807	.541	.807	.541	.537	.540	1.039	1.020
11	.825	.486	.825	.486	.522	.486	.970	1.085

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	-.8	-6.8	15.7	.423	.000	.072	.072	.028	.028
2	10.00	-2.1	-8.1	12.7	.406	.000	.058	.058	.022	.022
3	20.00	-3.0	-8.9	9.3	.398	.000	.050	.050	.018	.018
4	30.00	-1.7	-7.5	8.9	.403	.000	.044	.044	.015	.015
5	36.00	.4	-5.4	8.7	.425	.000	.049	.049	.016	.016
6	42.00	2.0	-3.8	7.0	.457	.000	.063	.063	.020	.020
7	50.00	2.1	-3.6	6.7	.463	.000	.059	.059	.018	.018
8	70.00	-1.0	-6.4	8.8	.426	.000	.056	.056	.014	.014
9	80.00	-1.4	-6.7	9.7	.417	.000	.056	.056	.013	.013
10	90.00	1.0	-4.1	13.4	.463	.000	.100	.100	.022	.022
11	95.00	1.9	-3.1	12.0	.547	.000	.197	.197	.042	.042

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(d) 100 Percent of design speed; reading 1168

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	31.7	1.5	31.7	1.5	336.5	1.000	14.84	.984
2	23.167	23.200	30.5	.6	30.5	.6	334.5	1.000	14.93	.989
3	21.981	22.068	29.9	-.8	29.9	-.8	331.6	1.000	15.06	.990
4	20.787	20.927	31.8	-.6	31.8	-.6	331.0	1.000	14.90	.991
5	20.071	20.244	34.4	-.4	34.4	-.4	330.8	1.000	14.59	.990
6	19.350	19.558	36.9	-1.5	36.9	-1.5	330.5	1.000	14.28	.991
7	18.387	18.649	38.1	-1.0	38.1	-1.0	331.1	1.000	14.46	.984
8	15.961	16.388	38.5	.6	38.5	.6	332.2	1.000	16.03	.978
9	14.732	15.263	41.0	.9	41.0	.9	333.0	1.000	16.32	.982
10	13.492	14.143	46.1	1.8	46.1	1.8	335.2	1.000	16.35	.964
11	12.868	13.586	48.1	-.1	48.1	-.1	335.6	1.000	16.42	.923

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	223.4	177.7	223.4	177.7	190.1	177.7	117.4	4.6	.0	.0
2	226.0	183.0	226.0	183.0	194.8	183.0	114.6	2.0	.0	.0
3	230.1	187.7	230.1	187.7	199.5	187.6	114.7	-2.6	.0	.0
4	226.1	182.6	226.1	182.6	192.2	182.6	119.2	-2.0	.0	.0
5	218.5	173.5	218.5	173.5	180.3	173.5	123.4	-1.3	.0	.0
6	211.9	164.9	211.9	164.9	169.5	164.8	127.1	-4.3	.0	.0
7	219.6	167.8	219.6	167.8	172.8	167.7	135.5	-2.9	.0	.0
8	261.6	202.3	261.6	202.3	204.6	202.3	163.0	2.3	.0	.0
9	275.3	216.1	275.3	216.1	207.7	216.0	180.7	3.5	.0	.0
10	287.8	214.5	287.8	214.5	199.7	214.4	207.3	6.7	.0	.0
11	294.2	200.4	294.2	200.4	196.6	200.4	218.9	-.5	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.631	.495	.631	.495	.537	.495	.935	.631
2	.641	.512	.641	.512	.553	.512	.939	.641
3	.657	.528	.657	.528	.570	.528	.941	.657
4	.645	.514	.645	.514	.548	.514	.950	.645
5	.622	.487	.622	.487	.513	.487	.962	.622
6	.602	.462	.602	.462	.482	.462	.973	.602
7	.625	.470	.625	.470	.492	.470	.970	.702
8	.756	.572	.756	.572	.591	.572	.989	.756
9	.799	.613	.799	.613	.603	.612	1.040	.804
10	.838	.606	.838	.606	.581	.605	1.074	.985
11	.858	.563	.858	.563	.573	.563	1.020	1.043

RP	PERCENT SPAN		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	-4.2	-10.2	14.6	.398	.000	.069	.069	.026	.026	
2	10.00	-5.3	-11.2	11.7	.377	.000	.044	.044	.016	.016	
3	20.00	-5.8	-11.7	8.5	.365	.000	.040	.040	.014	.014	
4	30.00	-4.2	-10.0	7.9	.372	.000	.038	.038	.013	.013	
5	36.00	-2.1	-7.9	7.8	.390	.000	.043	.043	.014	.014	
6	42.00	-.3	-6.1	6.5	.415	.000	.043	.043	.014	.014	
7	50.00	-.3	-5.9	6.9	.423	.000	.069	.069	.020	.020	
8	70.00	-3.3	-8.8	8.9	.384	.000	.070	.070	.018	.018	
9	80.00	-3.3	-8.6	9.9	.367	.000	.052	.052	.013	.013	
10	90.00	-1.2	-6.3	12.7	.405	.000	.097	.097	.022	.022	
11	95.00	-.8	-5.8	12.3	.472	.000	.201	.201	.043	.043	

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(e) 80 Percent of design speed; reading 136

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	33.4	.0	33.4	.0	318.3	1.000	12.96	.990
2	23.167	23.200	31.4	-.3	31.4	-.3	316.9	1.000	13.11	.991
3	21.981	22.068	29.6	-2.9	29.6	-2.9	314.5	1.000	13.19	.994
4	20.787	20.927	30.9	-2.6	30.9	-2.6	314.2	1.000	13.23	.994
5	20.071	20.244	33.1	-1.5	33.1	-1.5	314.8	1.000	13.21	.993
6	19.350	19.558	35.6	-.8	35.6	-.8	315.5	1.000	13.17	.993
7	18.387	18.649	37.6	-.2	37.6	-.2	316.1	1.000	13.22	.993
8	15.961	16.388	39.4	-.7	39.4	-.7	316.0	1.000	13.72	.990
9	14.732	15.263	41.8	-.6	41.8	-.6	316.7	1.000	13.89	.988
10	13.492	14.143	46.7	1.1	46.7	1.1	319.0	1.000	14.19	.976
11	12.868	13.586	49.0	-1.1	49.0	-1.1	319.4	1.000	14.21	.945

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	172.0	136.5	172.0	136.5	143.7	136.5	94.6	.1	.0	.0
2	178.3	144.3	178.3	144.3	152.2	144.3	92.8	-.7	.0	.0
3	183.5	151.4	183.5	151.4	159.5	151.2	90.7	-7.7	.0	.0
4	185.3	153.1	185.3	153.1	158.9	152.9	95.2	-6.8	.0	.0
5	185.8	152.6	185.8	152.6	155.7	152.6	101.5	-4.1	.0	.0
6	186.4	151.8	186.4	151.8	151.5	151.8	108.5	-2.1	.0	.0
7	191.1	154.3	191.1	154.3	151.3	154.3	116.7	-.6	.0	.0
8	210.5	167.7	210.5	167.7	162.8	167.7	133.5	-2.0	.0	.0
9	223.3	177.7	223.3	177.7	166.4	177.7	149.0	-2.0	.0	.0
10	239.4	181.1	239.4	181.1	164.2	181.1	174.1	3.6	.0	.0
11	245.0	168.3	245.0	168.3	160.8	168.3	184.8	-3.2	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.492	.387	.492	.387	.411	.387	.950	.562
2	.512	.411	.512	.411	.437	.411	.949	.512
3	.530	.434	.530	.434	.461	.433	.948	.530
4	.536	.439	.536	.439	.460	.439	.962	.536
5	.537	.437	.537	.437	.450	.437	.980	.537
6	.538	.434	.538	.434	.438	.434	1.002	.589
7	.552	.441	.552	.441	.437	.441	1.020	.633
8	.613	.481	.613	.481	.474	.481	1.030	.668
9	.652	.511	.652	.511	.486	.511	1.068	.732
10	.701	.519	.701	.519	.481	.519	1.102	.868
11	.718	.481	.718	.481	.471	.480	1.047	.923

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	-1.7	-7.6		14.1	.417	.000	.065	.065	.025	.025
2	10.00	-3.4	-9.4		11.8	.386	.000	.052	.052	.020	.020
3	20.00	-5.2	-11.1		7.3	.365	.000	.036	.036	.013	.013
4	30.00	-4.1	-10.0		6.9	.358	.000	.031	.031	.010	.010
5	36.00	-2.4	-8.2		7.6	.363	.000	.037	.037	.012	.012
6	42.00	-.7	-6.4		8.2	.371	.000	.039	.039	.012	.012
7	50.00	.2	-5.4		8.6	.375	.000	.040	.040	.012	.012
8	70.00	-1.6	-7.0		8.4	.369	.000	.043	.043	.011	.011
9	80.00	-1.5	-6.9		9.3	.364	.000	.047	.047	.011	.011
10	90.00	.4	-4.8		13.0	.398	.000	.086	.086	.019	.019
11	95.00	1.1	-4.0		12.2	.471	.000	.189	.189	.040	.040

TABLE VII. - Continued, BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(f) 80 Percent of design speed; reading 159

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	40.2	1.8	40.2	1.8	323.2	1.000	13.53	.990
2	23.167	23.200	38.4	1.1	38.4	1.1	321.5	1.000	13.57	.991
3	21.981	22.068	36.0	-1.8	36.0	-1.8	318.3	1.000	13.60	.993
4	20.787	20.927	37.7	-2.2	37.7	-2.2	317.8	1.000	13.54	.995
5	20.071	20.244	40.2	-.5	40.2	-.5	318.4	1.000	13.55	.994
6	19.350	19.558	42.2	.2	42.2	.2	319.0	1.000	13.54	.991
7	18.387	18.649	43.8	.9	43.8	.9	319.3	1.000	13.60	.990
8	15.961	16.388	43.9	-.5	43.9	-.5	317.5	1.000	13.82	.991
9	14.732	15.263	45.4	.6	45.4	.6	317.8	1.000	13.99	.988
10	13.492	14.143	50.1	3.8	50.1	3.8	319.6	1.000	14.25	.970
11	12.868	13.586	52.7	-.7	52.7	-.7	319.9	1.000	14.15	.946

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	170.0	129.6	170.0	129.6	129.9	129.5	109.6	4.0	.0	.0
2	172.5	132.3	172.5	132.3	135.2	132.3	107.2	2.4	.0	.0
3	174.4	135.0	174.4	135.0	141.0	134.9	102.6	-4.4	.0	.0
4	175.4	135.1	175.4	135.1	138.8	135.0	107.3	-5.1	.0	.0
5	177.3	134.6	177.3	134.6	135.5	134.6	114.3	-1.2	.0	.0
6	179.8	134.0	179.8	134.0	133.2	134.0	120.8	.5	.0	.0
7	185.6	135.5	185.6	135.5	134.0	135.4	128.4	2.1	.0	.0
8	202.2	145.5	202.2	145.5	145.7	145.5	140.2	-1.3	.0	.0
9	215.4	153.7	215.4	153.7	151.3	153.7	153.4	1.6	.0	.0
10	231.6	152.2	231.6	152.2	148.5	151.8	177.7	10.1	.0	.0
11	235.2	133.6	235.2	133.6	142.4	133.5	187.1	-1.5	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.483	.364	.483	.364	.369	.364	.997	.675
2	.491	.373	.491	.373	.385	.373	.979	.648
3	.500	.383	.500	.383	.404	.383	.957	.599
4	.503	.384	.503	.384	.398	.383	.973	.623
5	.508	.382	.508	.382	.388	.382	.994	.665
6	.515	.380	.515	.380	.382	.380	1.006	.701
7	.533	.384	.533	.384	.385	.384	1.011	.735
8	.585	.414	.585	.414	.422	.414	.998	.750
9	.626	.438	.626	.438	.440	.438	1.016	.795
10	.675	.432	.675	.432	.433	.431	1.022	.921
11	.686	.378	.686	.378	.416	.378	.938	.973

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	5.1	-.8	15.9	.476	.000	.066	.066	.025	.025
2	10.00	3.6	-2.3	13.1	.460	.000	.058	.058	.022	.022
3	20.00	1.3	-4.6	8.4	.443	.000	.042	.042	.015	.015
4	30.00	2.7	-3.2	7.3	.445	.000	.030	.030	.010	.010
5	36.00	4.6	-1.2	8.6	.451	.000	.036	.036	.012	.012
6	42.00	5.9	.2	9.2	.464	.000	.052	.052	.016	.016
7	50.00	6.4	.7	9.7	.472	.000	.058	.058	.017	.017
8	70.00	2.9	-2.5	8.6	.460	.000	.045	.045	.012	.012
9	80.00	2.0	-3.3	10.5	.453	.000	.052	.052	.013	.013
10	90.00	3.8	-1.4	15.6	.499	.000	.115	.115	.025	.025
11	95.00	4.8	-.2	12.7	.598	.000	.198	.198	.042	.042

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(g) 80 Percent of design speed; reading 172

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	49.8	3.1	49.8	3.1	328.8	1.000	13.91	.987
2	23.167	23.200	49.8	2.8	49.8	2.8	327.8	1.000	13.90	.986
3	21.981	22.068	48.7	4.1	48.7	4.1	325.5	1.000	13.89	.985
4	20.787	20.927	49.0	1.9	49.0	1.9	324.0	1.000	13.86	.981
5	20.071	20.244	50.3	.7	50.3	.7	323.6	1.000	13.82	.981
6	19.350	19.558	51.4	-1.2	51.4	-1.2	323.4	1.000	13.78	.980
7	18.387	18.649	51.8	-.7	51.8	-.7	323.0	1.000	13.78	.982
8	15.961	16.388	48.4	3.1	48.4	3.1	319.3	1.000	13.86	.981
9	14.732	15.263	48.3	4.7	48.3	4.7	319.2	1.000	14.11	.976
10	13.492	14.143	51.9	7.6	51.9	7.6	319.7	1.000	14.21	.960
11	12.868	13.586	55.4	.7	55.4	.7	320.1	1.000	14.03	.954

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	164.9	119.9	164.9	119.9	106.4	119.7	126.0	6.4	.0	.0
2	166.2	119.0	166.2	119.0	107.4	118.8	126.9	5.8	.0	.0
3	169.2	117.3	169.2	117.3	111.8	117.0	127.1	8.5	.0	.0
4	172.0	113.8	172.0	113.8	113.0	113.8	129.8	3.7	.0	.0
5	173.6	111.2	173.6	111.2	111.0	111.2	133.5	1.5	.0	.0
6	175.8	109.5	175.8	109.5	109.8	109.5	137.3	-2.2	.0	.0
7	180.8	109.6	180.8	109.6	111.9	109.6	142.1	-1.3	.0	.0
8	198.0	121.0	198.0	121.0	131.6	120.8	148.0	6.6	.0	.0
9	214.1	128.7	214.1	128.7	142.5	128.3	159.8	10.6	.0	.0
10	226.2	124.8	226.2	124.8	139.4	123.7	178.1	16.4	.0	.0
11	226.1	110.8	228.1	110.8	129.4	110.8	187.9	1.4	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.463	.334	.463	.334	.299	.333	1.125	.797
2	.468	.331	.468	.331	.302	.331	1.106	.795
3	.479	.328	.479	.328	.316	.327	1.047	.782
4	.488	.319	.488	.319	.320	.319	1.007	.791
5	.493	.311	.493	.311	.315	.311	1.002	.812
6	.500	.307	.500	.307	.312	.307	.997	.831
7	.515	.307	.515	.307	.319	.307	.980	.847
8	.571	.342	.571	.342	.379	.341	.918	.817
9	.620	.364	.620	.364	.413	.363	.900	.847
10	.658	.352	.658	.352	.406	.349	.887	.934
11	.663	.312	.663	.312	.376	.312	.856	.997

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	14.6	8.6	16.9	.551	.000	.097	.097	.037	.037	
2	10.00	14.7	8.8	14.6	.557	.000	.099	.099	.037	.037	
3	20.00	13.6	7.7	14.1	.555	.000	.107	.107	.038	.038	
4	30.00	13.6	7.8	11.1	.584	.000	.124	.124	.042	.042	
5	36.00	14.5	8.7	9.6	.606	.000	.125	.125	.041	.041	
6	42.00	14.8	9.1	7.6	.625	.000	.126	.126	.040	.040	
7	50.00	14.1	8.4	7.9	.629	.000	.111	.111	.033	.033	
8	70.00	7.2	1.7	12.0	.572	.000	.094	.094	.024	.024	
9	80.00	4.7	-.7	14.4	.563	.000	.103	.103	.025	.025	
10	90.00	5.4	.2	19.1	.602	.000	.160	.160	.035	.035	
11	95.00	7.3	2.3	13.8	.683	.000	.182	.182	.039	.039	

TABLE VII. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(h) 80 Percent of design speed; reading 183

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.757	23.762	44.8	2.0	44.8	2.0	326.3	1.000	13.82	.989
2	23.167	23.200	44.3	2.2	44.3	2.2	324.9	1.000	13.81	.990
3	21.981	22.068	43.0	.7	43.0	.7	322.2	1.000	13.78	.990
4	20.787	20.927	44.4	1.0	44.4	1.0	321.4	1.000	13.76	.988
5	20.071	20.244	46.1	1.5	46.1	1.5	321.6	1.000	13.74	.986
6	19.350	19.558	47.8	.8	47.8	.8	321.7	1.000	13.71	.985
7	18.387	18.649	48.8	1.6	48.8	1.6	321.5	1.000	13.74	.985
8	15.961	16.388	46.6	1.7	46.6	1.7	318.7	1.000	13.85	.988
9	14.732	15.263	47.1	3.1	47.1	3.1	318.7	1.000	14.11	.981
10	13.492	14.143	51.1	6.5	51.1	6.5	319.6	1.000	14.21	.962
11	12.868	13.586	54.5	.4	54.5	.4	320.1	1.000	14.05	.952

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	167.8	125.3	167.8	125.3	119.1	125.2	118.1	4.3	.0	.0
2	168.9	125.5	168.9	125.5	120.9	125.4	117.9	4.8	.0	.0
3	169.7	124.4	169.7	124.4	124.1	124.4	115.7	1.5	.0	.0
4	172.5	122.2	172.5	122.2	123.3	122.2	120.6	2.2	.0	.0
5	174.2	120.3	174.2	120.3	120.7	120.2	125.6	3.1	.0	.0
6	176.5	118.7	176.5	118.7	118.5	118.7	130.8	1.7	.0	.0
7	181.9	120.0	181.9	120.0	119.8	119.9	136.9	3.3	.0	.0
8	200.3	132.2	200.3	132.2	137.5	132.2	145.5	3.9	.0	.0
9	215.6	139.0	215.6	139.0	146.8	138.8	157.9	7.4	.0	.0
10	228.1	134.5	228.1	134.5	143.1	133.6	177.6	15.3	.0	.0
11	230.4	119.7	230.4	119.7	133.7	119.7	187.6	.8	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.474	.350	.474	.350	.336	.350	1.051	.733
2	.478	.352	.478	.352	.342	.351	1.037	.723
3	.482	.350	.482	.350	.353	.350	1.003	.696
4	.491	.344	.491	.344	.351	.344	.991	.720
5	.496	.338	.496	.338	.344	.338	.996	.748
6	.503	.334	.503	.334	.338	.334	1.002	.777
7	.520	.338	.520	.338	.342	.338	1.001	.802
8	.578	.375	.578	.375	.397	.375	.961	.793
9	.626	.394	.626	.394	.426	.394	.945	.827
10	.664	.381	.664	.381	.417	.378	.934	.924
11	.671	.338	.671	.338	.389	.338	.895	.987

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	9.5	3.5	15.8	.513	.000	.075	.075	.029	.029
2	10.00	9.2	3.3	14.0	.507	.000	.069	.069	.026	.026
3	20.00	8.0	2.1	10.6	.505	.000	.067	.067	.024	.024
4	30.00	9.0	3.2	10.3	.522	.000	.079	.079	.027	.027
5	36.00	10.4	4.6	10.4	.537	.000	.088	.088	.029	.029
6	42.00	11.3	5.5	9.6	.555	.000	.096	.096	.030	.030
7	50.00	11.1	5.5	10.1	.558	.000	.087	.087	.026	.026
8	70.00	5.4	-.0	10.6	.521	.000	.061	.061	.016	.016
9	80.00	3.5	-1.9	12.7	.520	.000	.083	.083	.020	.020
10	90.00	4.6	-.6	18.1	.564	.000	.147	.147	.032	.032
11	95.00	6.4	1.4	13.4	.648	.000	.184	.184	.039	.039

TABLE VIII. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(a) 100 Percent of design speed; reading 123

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.533	23.188	2.9	45.7	65.0	55.2	349.0	1.169	16.00	1.568
2	23.002	22.708	2.1	45.6	64.0	54.2	346.2	1.170	16.06	1.566
3	21.951	21.742	2.0	46.1	62.3	51.8	341.9	1.167	16.14	1.552
4	20.899	20.780	1.8	46.0	61.6	49.4	339.7	1.161	16.06	1.557
5	20.272	20.206	1.6	45.7	62.1	47.6	339.1	1.158	15.83	1.574
6	19.647	19.637	-.2	44.9	62.9	46.3	338.4	1.156	15.57	1.589
7	18.814	18.887	-.4	46.0	62.6	44.2	337.4	1.154	15.53	1.576
8	16.721	17.071	.8	49.2	58.4	35.0	334.7	1.150	15.80	1.536
9	15.651	16.198	2.5	52.4	56.0	27.8	335.0	1.150	15.96	1.523
10	14.536	15.352	6.1	55.4	56.1	17.3	336.4	1.150	15.71	1.529
11	13.952	14.938	-.9	51.9	61.8	16.8	337.0	1.152	15.20	1.555

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	181.0	226.7	427.1	277.7	180.7	158.4	9.1	162.2	396.1	390.3
2	185.3	226.9	423.0	271.2	185.1	158.7	6.8	162.2	387.2	382.2
3	190.0	228.0	408.6	255.4	189.9	158.1	6.7	164.4	368.5	365.0
4	186.6	228.2	392.2	243.3	186.5	158.4	5.8	164.2	350.8	348.8
5	178.1	229.0	379.9	237.5	178.0	160.0	5.0	163.9	340.5	339.4
6	168.7	227.6	370.9	233.4	168.7	161.1	-.5	160.7	329.7	329.6
7	164.6	228.0	358.2	221.2	164.6	158.5	-1.2	163.9	317.0	318.2
8	171.6	236.4	327.5	188.5	171.5	154.4	2.3	179.0	281.3	287.2
9	172.6	244.7	308.6	168.7	172.5	149.2	7.5	193.9	263.5	272.7
10	154.3	258.4	275.0	153.8	153.4	146.8	16.4	212.6	244.7	258.4
11	127.3	258.3	269.1	166.3	127.3	159.2	-2.1	203.4	235.0	251.5

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.495	.579	1.168	.709	.494	.434	.876	1.367
2	.510	.582	1.163	.695	.509	.407	.857	1.353
3	.527	.589	1.133	.660	.527	.409	.832	1.325
4	.519	.593	1.090	.633	.518	.412	.850	1.329
5	.494	.597	1.054	.619	.494	.417	.899	1.358
6	.468	.594	1.028	.609	.468	.421	.955	1.410
7	.456	.597	.993	.579	.456	.415	.963	1.427
8	.478	.624	.913	.490	.478	.408	.900	1.280
9	.481	.648	.861	.447	.481	.395	.865	1.184
10	.427	.686	.762	.408	.425	.390	.957	1.092
11	.350	.684	.740	.441	.350	.422	1.250	1.220

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00		3.0	.5	.9	.484	.809	.161	.134	.035	.029
2	10.00		3.0	.5	.6	.494	.804	.167	.142	.036	.031
3	20.00		2.9	.2	.4	.511	.800	.174	.156	.038	.034
4	30.00		3.9	.9	.7	.516	.834	.149	.133	.033	.029
5	36.00		5.5	2.1	.9	.512	.875	.116	.100	.026	.022
6	42.00		7.4	3.7	1.8	.509	.906	.090	.071	.020	.016
7	50.00		8.5	4.3	3.1	.524	.900	.099	.081	.022	.018
8	70.00		7.1	1.9	5.1	.574	.867	.145	.143	.033	.032
9	80.00		5.3	-.1	5.7	.611	.848	.182	.182	.041	.041
10	90.00		4.6	-.7	5.6	.618	.860	.203	.203	.046	.046
11	95.00		8.9	4.0	11.6	.564	.885	.177	.177	.039	.039

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(b) 100 Percent of design speed; reading 1140

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.533	23.188	1.4	40.6	63.8	56.0	337.7	1.157	14.75	1.523
2	23.002	22.708	.6	40.6	62.3	55.0	335.5	1.158	14.93	1.510
3	21.951	21.742	-.6	39.4	60.5	53.1	332.6	1.153	15.07	1.501
4	20.899	20.780	-.4	39.8	59.9	51.0	331.8	1.147	14.92	1.510
5	20.272	20.206	-.3	40.3	6	49.5	331.6	1.145	14.61	1.539
6	19.647	19.637	-1.4	39.9	61.5	47.8	331.2	1.144	14.31	1.570
7	18.814	18.887	-1.2	39.5	60.1	44.2	331.6	1.141	14.37	1.579
8	16.721	17.071	.4	40.1	52.6	33.9	332.3	1.134	15.73	1.481
9	15.651	16.198	.6	41.7	50.0	28.0	332.9	1.136	16.02	1.456
10	14.536	15.352	1.7	42.9	50.2	20.9	335.1	1.134	15.81	1.473
11	13.952	14.938	-.6	42.0	54.1	18.9	335.5	1.135	15.17	1.518

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	191.7	218.9	434.5	297.0	191.7	166.2	4.6	142.6	394.5	388.7
2	201.4	219.3	433.1	290.4	201.4	166.5	2.1	142.7	385.5	380.6
3	209.6	219.2	425.4	281.9	209.6	169.3	-2.1	139.2	368.1	364.6
4	203.8	219.2	406.4	267.6	203.7	168.4	-1.5	140.3	350.2	348.2
5	192.5	220.0	391.2	258.1	192.5	167.7	-1.0	142.4	339.6	338.5
6	181.6	221.5	380.2	252.8	181.6	169.8	-4.4	142.2	329.7	329.5
7	183.3	228.3	367.9	245.4	183.3	176.0	-4.0	145.4	315.1	316.3
8	213.0	246.7	350.7	227.5	213.0	188.7	1.5	158.9	280.1	286.0
9	218.5	256.0	340.0	216.7	218.5	191.3	2.3	170.2	262.7	271.9
10	198.1	267.6	309.1	209.6	198.0	195.9	5.9	182.3	243.3	257.0
11	170.4	270.9	290.7	212.7	170.4	201.2	-1.8	181.4	233.7	250.2

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.535	.571	1.213	.774	.535	.433	.867	1.364
2	.566	.573	1.217	.759	.566	.435	.827	1.337
3	.593	.577	1.204	.742	.593	.446	.808	1.319
4	.576	.579	1.150	.707	.576	.445	.827	1.312
5	.543	.583	1.103	.683	.543	.444	.871	1.334
6	.511	.587	1.069	.670	.511	.450	.935	1.379
7	.515	.607	1.035	.653	.515	.468	.961	1.359
8	.604	.662	.994	.610	.604	.506	.886	1.179
9	.620	.688	.965	.582	.620	.514	.875	1.105
10	.556	.720	.868	.564	.556	.527	.989	1.059
11	.475	.729	.810	.572	.475	.541	1.181	1.123

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	TOT P				ROF	TOT	PROF	
1	5.00	1.9	-.6	1.7	.436	.812	.143	.112	.030	.024	
2	10.00	1.2	-1.3	1.4	.449	.790	.160	.131	.034	.028	
3	20.00	1.1	-1.6	1.7	.454	.801	.151	.126	.032	.027	
4	30.00	2.2	-.8	2.3	.459	.846	.120	.101	.026	.022	
5	36.00	3.9	.6	2.7	.461	.901	.081	.064	.017	.014	
6	42.00	6.0	2.3	3.2	.458	.952	.041	.022	.009	.005	
7	50.00	6.0	1.8	3.0	.457	.984	.014	-.000	.003	-.000	
8	70.00	1.3	-3.9	4.0	.475	.883	.104	.102	.024	.023	
9	80.00	-.7	-6.1	5.9	.492	.833	.155	.155	.035	.035	
10	90.00	-1.4	-6.6	9.2	.463	.870	.141	.141	.032	.032	
11	95.00	1.3	-3.7	13.7	.419	.935	.080	.080	.017	.017	

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(c) 100 Percent of design speed; reading 1157

RP	RADII		ABS IN	BETAM OUT	REL IN	BETAM OUT	TOTAL IN	TEMP RATIO	TOTAL IN	PRESS RATIO
	IN	OUT								
1	23.533	23.188	2.4	42.7	63.7	55.4	341.4	1.162	15.22	1.541
2	23.002	22.708	1.5	42.9	62.4	54.5	339.1	1.163	15.37	1.527
3	21.951	21.742	.0	42.2	60.9	52.5	335.5	1.161	15.46	1.524
4	20.899	20.780	.3	42.3	60.3	50.3	334.2	1.154	15.28	1.531
5	20.272	20.206	.5	42.7	61.0	48.9	333.9	1.150	14.98	1.555
6	19.647	19.637	-.9	41.9	61.9	47.1	333.5	1.149	14.68	1.586
7	18.814	18.887	-1.1	41.2	60.9	43.8	333.3	1.145	14.73	1.589
8	16.721	17.071	.6	42.2	54.2	34.5	332.9	1.137	15.82	1.504
9	15.651	16.198	.6	44.3	51.8	28.2	333.1	1.140	16.02	1.478
10	14.536	15.352	2.6	46.3	51.9	20.7	335.3	1.138	15.85	1.493
11	13.952	14.938	-.4	45.5	56.4	19.2	335.8	1.139	15.22	1.526

RP	ABS VEL		REL IN	VEL OUT	MERID IN	VEL OUT	TANG IN	VEL OUT	WHEEL IN	SPEED OUT
	IN	OUT								
1	191.5	223.8	432.6	289.6	191.3	164.5	8.0	151.8	396.0	390.1
2	199.7	223.2	430.2	281.6	199.6	163.4	5.2	152.1	386.3	381.4
3	205.8	223.7	422.8	272.1	205.8	165.9	.1	150.1	369.4	365.9
4	199.1	222.8	402.2	258.1	199.1	164.8	1.1	149.9	350.5	348.5
5	188.0	223.2	387.4	249.5	188.0	164.2	1.6	151.3	340.3	339.2
6	177.2	224.4	376.6	245.2	177.1	167.0	-2.8	149.9	329.5	329.3
7	177.6	229.6	364.9	239.2	177.6	172.8	-3.3	151.2	315.5	316.7
8	200.5	242.7	343.2	218.2	200.5	180.0	1.9	162.9	280.5	286.4
9	204.3	250.8	330.7	203.7	204.3	179.5	2.3	175.2	262.3	271.5
10	184.7	261.6	299.1	193.1	184.5	180.7	8.3	189.2	243.7	257.4
11	156.4	261.4	282.4	193.9	156.4	183.1	-1.2	186.6	234.0	250.5

RP	ABS MACH NO		REL IN	MACH NO OUT	MERID IN	MACH NO OUT	MERID PEAK SS	
	IN	OUT					VEL R	MACH NO
1	.532	.580	1.201	.750	.531	.426	.860	1.351
2	.558	.580	1.201	.731	.558	.424	.819	1.325
3	.579	.585	1.190	.711	.579	.434	.806	1.321
4	.560	.586	1.132	.678	.560	.433	.828	1.313
5	.528	.588	1.087	.657	.528	.432	.873	1.339
6	.496	.592	1.054	.647	.496	.441	.943	1.387
7	.497	.608	1.022	.633	.497	.457	.973	1.380
8	.566	.648	.968	.583	.566	.481	.897	1.211
9	.577	.671	.934	.545	.577	.480	.878	1.142
10	.517	.701	.837	.517	.516	.484	.979	1.076
11	.434	.699	.783	.519	.434	.490	1.171	1.148

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	1.8	-.7	1.1	.455	.810	.150	.122	.032	.026
2	10.00	1.3	-1.2	1.0	.471	.786	.170	.145	.037	.031
3	20.00	1.4	-1.2	1.1	.481	.790	.168	.144	.036	.031
4	30.00	2.7	-.4	1.6	.483	.840	.132	.114	.028	.025
5	36.00	4.4	1.0	2.1	.483	.891	.093	.077	.020	.017
6	42.00	6.4	2.7	2.5	.478	.941	.053	.034	.011	.007
7	50.00	6.7	2.6	2.6	.474	.970	.027	.012	.006	.003
8	70.00	2.9	-2.3	4.5	.494	.899	.094	.093	.021	.021
9	80.00	1.1	-4.3	6.1	.521	.843	.157	.157	.036	.036
10	90.00	.4	-4.9	9.0	.504	.877	.145	.145	.033	.033
11	95.00	3.5	-1.4	14.0	.472	.922	.103	.103	.022	.022

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(d) 100 Percent of design speed; reading 1168

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.533	23.188	1.4	35.0	63.6	57.4	336.5	1.133	14.60	1.385
2	23.002	22.708	.6	34.1	62.2	55.8	334.5	1.133	14.77	1.388
3	21.951	21.742	-.7	32.0	60.3	53.5	331.6	1.129	14.91	1.399
4	20.899	20.780	-.6	32.4	59.8	51.5	331.0	1.125	14.76	1.410
5	20.272	20.206	-.4	33.4	60.3	50.1	330.8	1.124	14.45	1.438
6	19.647	19.637	-1.3	33.5	61.2	49.1	330.5	1.123	14.15	1.460
7	18.814	18.887	-.9	34.3	59.7	46.7	331.1	1.120	14.23	1.451
8	16.721	17.071	.6	36.3	51.8	35.6	332.2	1.122	15.68	1.372
9	15.651	16.198	.9	37.7	49.0	27.7	333.0	1.129	16.03	1.388
10	14.536	15.352	1.8	39.3	49.3	19.3	335.2	1.133	15.76	1.443
11	13.952	14.938	-.1	38.7	52.8	17.5	335.6	1.133	15.16	1.474

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	194.1	210.2	436.6	319.7	194.0	172.2	4.6	120.6	395.7	389.9
2	203.3	214.4	435.2	316.2	203.3	177.5	2.0	120.1	386.7	381.8
3	211.6	218.2	427.7	311.0	211.6	185.1	-2.6	115.6	369.1	365.6
4	206.1	218.6	409.1	296.6	206.1	184.5	-2.0	117.2	351.4	349.4
5	194.7	218.6	392.9	284.7	194.7	182.5	-1.3	120.4	340.0	338.9
6	183.8	217.5	381.0	276.8	183.7	181.3	-4.3	120.1	329.4	329.3
7	186.1	220.3	368.9	265.2	186.1	182.0	-2.8	124.0	315.6	316.9
8	219.4	245.2	354.8	243.1	219.4	197.6	2.2	145.3	281.0	286.9
9	225.6	265.2	343.9	237.1	225.5	209.9	3.4	162.1	263.1	272.3
10	204.5	285.0	313.6	233.7	204.4	220.5	6.5	180.6	244.3	258.0
11	177.9	287.4	294.4	235.3	177.9	224.4	-.4	179.7	234.1	250.6

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.543	.554	1.222	.842	.543	.454	.888	1.365
2	.572	.567	1.225	.836	.572	.469	.873	1.340
3	.600	.582	1.213	.829	.600	.493	.875	1.323
4	.584	.585	1.160	.793	.584	.493	.995	1.315
5	.550	.585	1.110	.762	.550	.488	.938	1.331
6	.518	.582	1.073	.741	.518	.485	.987	1.371
7	.524	.590	1.039	.711	.524	.488	.978	1.346
8	.624	.661	1.008	.655	.623	.533	.900	1.153
9	.642	.717	.978	.641	.642	.568	.931	1.075
10	.575	.772	.882	.633	.575	.597	1.079	1.046
11	.496	.779	.821	.638	.496	.608	1.261	1.102

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00		1.7	-.8	3.1	.367	.733	.173	.140	.035	.029
2	10.00		1.1	-1.4	2.3	.373	.735	.172	.143	.036	.030
3	20.00		.9	-1.8	2.1	.370	.779	.143	.117	.030	.025
4	30.00		2.1	-1.0	2.8	.373	.826	.116	.096	.024	.020
5	36.00		3.7	.3	3.3	.377	.881	.084	.066	.018	.014
6	42.00		5.7	2.0	4.5	.377	.925	.055	.037	.011	.008
7	50.00		5.6	1.4	5.5	.386	.931	.053	.039	.011	.008
8	70.00		.5	-4.7	5.7	.426	.772	.181	.179	.040	.040
9	80.00		-1.7	-7.1	5.5	.432	.762	.205	.205	.047	.047
10	90.00		-2.2	-7.5	7.6	.392	.829	.179	.179	.041	.041
11	95.00		-.1	-5.0	12.3	.347	.877	.145	.145	.032	.032

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(e) 80 Percent of design speed; reading 136

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.533	23.188	.0	25.9	65.1	60.6	318.3	1.066	12.83	1.180
2	23.002	22.708	-.3	24.8	63.1	57.3	316.9	1.068	13.00	1.198
3	21.951	21.742	-2.6	22.1	61.1	54.4	314.5	1.068	13.11	1.210
4	20.899	20.780	-2.3	22.6	59.5	52.2	314.2	1.067	13.15	1.216
5	20.272	20.206	-1.4	23.9	58.5	50.6	314.8	1.066	13.12	1.221
6	19.647	19.637	-.7	25.0	57.8	48.7	315.5	1.065	13.08	1.231
7	18.814	18.887	-.2	26.3	56.2	45.2	316.1	1.068	13.12	1.244
8	16.721	17.071	-.6	28.8	51.7	34.0	316.0	1.076	13.59	1.247
9	15.651	16.198	-.6	31.0	49.1	26.5	316.7	1.083	13.73	1.272
10	14.536	15.352	1.1	34.1	47.9	17.3	319.0	1.089	13.85	1.289
11	13.952	14.938	-1.2	33.2	51.7	15.0	319.4	1.092	13.43	1.334

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	147.4	153.9	350.2	282.0	147.4	138.4	.1	67.3	317.7	313.1
2	158.2	167.0	349.1	280.8	158.2	151.6	-.7	70.2	310.5	306.6
3	167.9	175.6	346.9	279.4	167.7	162.7	-7.7	65.9	295.9	293.1
4	170.5	178.0	335.3	268.2	170.3	164.4	-6.8	68.4	281.9	280.3
5	169.9	179.7	325.5	258.8	169.8	164.4	-4.1	72.7	273.5	272.6
6	168.5	182.7	316.4	250.6	168.5	165.5	-2.1	77.3	265.7	265.5
7	170.5	189.5	306.6	241.1	170.5	169.8	-.6	84.0	254.2	255.2
8	179.8	214.7	290.0	226.9	179.8	188.2	-2.0	103.5	225.6	230.3
9	184.2	231.2	281.4	221.6	184.2	198.2	-1.9	119.1	210.8	218.1
10	173.6	252.4	259.0	219.1	173.6	209.1	3.5	141.3	195.6	206.6
11	151.1	261.1	243.9	226.3	151.0	218.6	-3.2	142.9	188.3	201.6

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.419	.424	.996	.778	.419	.381	.939	1.265
2	.452	.463	.998	.778	.452	.420	.958	1.215
3	.483	.489	.998	.779	.483	.453	.970	1.202
4	.491	.497	.966	.749	.491	.459	.965	1.164
5	.489	.502	.937	.722	.489	.459	.968	1.131
6	.484	.510	.909	.699	.484	.462	.982	1.106
7	.490	.529	.881	.673	.490	.474	.996	1.059
8	.518	.602	.835	.636	.518	.527	1.046	.958
9	.531	.649	.811	.621	.531	.556	1.076	.894
10	.497	.709	.741	.615	.497	.587	1.205	.831
11	.429	.734	.693	.637	.429	.615	1.447	.903

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	3.2	.7	6.3	.267	.737	.117	.112	.022	.021	
2	10.00	2.0	-.5	3.8	.270	.776	.103	.101	.021	.020	
3	20.00	1.7	-1.0	3.0	.269	.817	.085	.083	.018	.017	
4	30.00	1.8	-1.3	3.5	.276	.859	.068	.067	.014	.014	
5	36.00	1.9	-1.4	3.8	.282	.888	.056	.055	.012	.012	
6	42.00	2.3	-1.4	4.1	.288	.923	.040	.040	.009	.009	
7	50.00	2.1	-2.1	4.1	.298	.947	.030	.030	.006	.006	
8	70.00	.4	-4.8	4.0	.318	.850	.101	.101	.023	.023	
9	80.00	-1.6	-7.0	4.4	.325	.858	.109	.109	.025	.025	
10	90.00	-3.6	-8.9	5.6	.286	.843	.148	.148	.034	.034	
11	95.00	-1.1	-6.1	9.8	.215	.936	.069	.069	.015	.015	

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(f) 80 Percent of design speed; reading 159

RP	RADII		ABS BETAM		REL BETAM		TOTAL IN	TEMP RATIO	TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT			IN	RATIO
1	23.533	23.188	1.6	37.2	66.0	56.9	323.2	1.096	13.40	1.308
2	23.002	22.708	1.0	37.2	64.9	55.6	321.5	1.097	13.45	1.311
3	21.951	21.742	-1.7	35.7	63.6	53.5	318.3	1.097	13.52	1.305
4	20.899	20.780	-2.0	35.2	62.5	51.7	317.8	1.092	13.48	1.311
5	20.272	20.206	-.5	36.3	61.5	49.9	318.4	1.090	13.47	1.313
6	19.647	19.637	.2	37.0	60.8	48.0	319.0	1.088	13.43	1.319
7	18.814	18.887	.8	38.0	59.4	44.5	319.3	1.088	13.46	1.323
8	16.721	17.071	-.5	40.2	55.6	34.0	317.5	1.093	13.69	1.325
9	15.651	16.198	.6	42.7	52.8	26.6	317.8	1.096	13.82	1.322
10	14.536	15.352	3.9	44.6	51.8	17.3	319.6	1.095	13.82	1.334
11	13.952	14.938	-.7	42.1	57.5	16.2	319.9	1.096	13.39	1.369

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	139.7	171.2	342.9	249.5	139.6	136.3	4.0	103.6	317.2	312.6
2	144.4	173.3	340.0	244.3	144.4	138.1	2.5	104.7	310.3	306.3
3	148.8	173.7	334.4	237.3	148.8	141.0	-4.4	101.4	295.1	292.3
4	149.4	173.9	323.3	229.2	149.3	142.1	-5.1	100.3	281.7	280.1
5	148.9	176.0	312.2	220.1	148.8	141.9	-1.2	104.1	273.3	272.4
6	147.8	178.1	303.1	212.3	147.8	142.2	.5	107.3	265.2	265.0
7	148.7	183.3	292.4	202.6	148.7	144.4	2.1	112.8	253.9	254.9
8	155.1	198.3	274.6	182.7	155.1	151.6	-1.3	127.9	225.3	230.0
9	158.8	208.8	262.8	171.5	158.8	153.3	1.6	141.7	211.1	218.5
10	146.5	224.0	236.6	167.0	146.2	159.5	9.8	157.3	195.9	206.8
11	121.0	227.3	224.9	175.4	121.0	168.5	-1.5	152.5	188.1	201.4

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.394	.464	.966	.676	.393	.369	.976	1.258
2	.408	.471	.962	.663	.408	.375	.956	1.237
3	.424	.474	.952	.648	.423	.385	.948	1.236
4	.426	.476	.921	.628	.425	.389	.952	1.216
5	.424	.482	.888	.603	.424	.389	.953	1.173
6	.420	.488	.861	.582	.420	.390	.962	1.144
7	.423	.503	.831	.556	.423	.396	.971	1.101
8	.443	.547	.784	.504	.443	.418	.977	1.020
9	.453	.577	.751	.473	.453	.423	.966	.947
10	.416	.620	.671	.462	.415	.441	1.091	.862
11	.341	.629	.635	.486	.341	.466	1.392	.954

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	4.1	1.6	2.6	.381	.835	.109	.105	.022	.022
2	10.00	3.8	1.3	2.0	.392	.832	.113	.110	.024	.023
3	20.00	4.2	1.5	2.2	.402	.816	.125	.123	.026	.026
4	30.00	4.8	1.8	3.0	.401	.871	.089	.088	.019	.018
5	36.00	4.9	1.6	3.1	.406	.904	.068	.068	.014	.014
6	42.00	5.3	1.6	3.4	.412	.935	.047	.047	.010	.010
7	50.00	5.3	1.1	3.4	.423	.948	.040	.040	.009	.009
8	70.00	4.3	-.9	4.0	.465	.898	.091	.091	.021	.021
9	80.00	2.1	-3.3	4.4	.487	.868	.130	.130	.030	.030
10	90.00	.3	-4.9	5.6	.448	.901	.117	.117	.027	.027
11	95.00	4.6	-.3	11.0	.383	.975	.033	.033	.007	.007

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(g) 80 Percent of design speed; reading 172

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.533	23.188	2.9	45.5	67.4	57.9	328.8	1.108	13.72	1.327
2	23.002	22.708	2.6	46.2	66.9	56.7	327.8	1.109	13.71	1.333
3	21.951	21.742	3.8	48.3	65.9	54.3	325.5	1.109	13.68	1.331
4	20.899	20.780	1.7	47.4	65.8	52.5	324.0	1.106	13.60	1.333
5	20.272	20.206	.7	46.2	65.8	50.8	323.6	1.104	13.55	1.334
6	19.647	19.637	-1.0	44.6	65.8	49.2	323.4	1.101	13.51	1.334
7	18.814	18.887	-.6	44.6	64.8	46.2	323.0	1.098	13.52	1.332
8	16.721	17.071	2.9	48.0	59.6	32.7	319.3	1.100	13.60	1.340
9	15.651	16.198	4.5	49.9	56.7	24.8	319.2	1.100	13.78	1.337
10	14.536	15.352	7.6	51.3	56.4	15.4	319.7	1.099	13.64	1.341
11	13.952	14.938	.8	47.6	61.7	15.7	320.1	1.099	13.38	1.352

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	128.9	170.5	335.7	224.5	128.8	119.4	6.5	121.7	316.5	311.9
2	129.4	172.1	330.1	217.2	129.3	119.2	5.9	124.1	309.6	305.6
3	128.7	171.9	314.1	199.2	128.4	116.3	8.5	130.7	295.2	292.4
4	125.2	173.2	305.0	192.6	125.1	117.3	3.7	127.4	281.8	280.2
5	122.2	173.8	298.3	190.2	122.2	120.3	1.5	125.4	273.6	272.7
6	120.0	173.3	292.8	188.9	120.0	123.3	-2.2	121.7	264.9	264.8
7	119.6	175.8	281.3	181.0	119.6	125.2	-1.3	123.5	253.2	254.2
8	128.4	196.1	253.6	155.8	128.2	131.2	6.4	145.8	225.2	229.9
9	132.6	205.7	240.5	145.9	132.2	132.5	10.3	157.4	211.3	218.7
10	120.5	217.2	216.0	140.8	119.4	135.7	16.0	169.6	196.0	207.0
11	100.8	217.0	212.3	152.0	100.8	146.3	1.4	160.3	188.2	201.5

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.359	.455	.935	.599	.359	.318	.927	1.268
2	.361	.460	.922	.580	.361	.318	.922	1.254
3	.361	.469	.880	.535	.360	.312	.905	1.215
4	.351	.466	.856	.519	.351	.316	.937	1.228
5	.343	.469	.837	.513	.343	.324	.984	1.230
6	.337	.468	.822	.510	.337	.333	1.028	1.233
7	.336	.477	.790	.491	.336	.339	1.047	1.194
8	.363	.537	.717	.427	.363	.359	1.023	1.035
9	.375	.565	.681	.401	.374	.364	1.002	.953
10	.340	.599	.610	.388	.337	.374	1.137	.882
11	.283	.598	.597	.418	.283	.403	1.451	.982

RP	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	5.5	3.0	3.6	.460	.775	.171	.169	.034	.034
2	10.00	5.9	3.4	3.2	.474	.781	.173	.171	.035	.035
3	20.00	6.4	3.8	2.9	.503	.779	.186	.185	.038	.038
4	30.00	8.1	5.0	3.8	.505	.805	.168	.168	.035	.035
5	36.00	9.2	5.9	4.0	.499	.828	.150	.150	.031	.031
6	42.00	10.3	6.6	4.7	.490	.852	.130	.130	.027	.027
7	50.00	10.7	6.5	5.1	.492	.873	.116	.116	.024	.024
8	70.00	8.3	3.1	2.7	.538	.874	.137	.137	.032	.032
9	80.00	6.0	.5	2.7	.554	.862	.165	.165	.038	.038
10	90.00	4.9	-.3	3.7	.525	.881	.171	.171	.040	.040
11	95.00	8.8	3.9	10.5	.463	.905	.143	.143	.032	.032

TABLE VIII. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(h) 80 Percent of design speed; reading 183

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.533	23.188	1.9	40.5	66.7	56.9	326.3	1.102	13.67	1.324
2	23.002	22.708	2.0	41.9	65.9	55.7	324.9	1.104	13.68	1.327
3	21.951	21.742	.6	42.4	65.1	53.9	322.2	1.105	13.64	1.327
4	20.899	20.780	.9	42.8	64.3	51.5	321.4	1.101	13.59	1.334
5	20.272	20.206	1.3	43.0	63.9	49.6	321.6	1.099	13.55	1.335
6	19.647	19.637	.7	42.5	63.6	47.9	321.7	1.096	13.50	1.339
7	18.814	18.887	1.4	43.0	62.3	45.2	321.5	1.094	13.54	1.332
8	16.721	17.071	1.6	45.3	57.6	33.8	318.7	1.096	13.68	1.332
9	15.651	16.198	2.9	47.4	55.0	25.8	318.7	1.098	13.84	1.334
10	14.536	15.352	6.6	49.6	54.6	15.7	319.6	1.098	13.68	1.350
11	13.952	14.938	.4	46.6	59.9	16.2	320.1	1.098	13.38	1.358

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	134.9	172.6	341.4	240.3	134.8	131.3	4.4	112.1	318.0	313.4
2	136.8	173.8	334.2	229.8	136.7	129.4	4.8	116.0	309.8	305.8
3	136.8	174.1	325.3	218.4	136.8	128.6	1.5	117.4	296.6	293.8
4	134.7	175.3	310.9	206.6	134.7	128.6	2.2	119.1	282.4	280.8
5	132.4	176.4	300.7	199.3	132.4	129.0	3.0	120.3	273.0	272.1
6	130.4	177.0	292.9	194.5	130.4	130.5	1.7	119.6	264.0	263.9
7	131.2	179.4	282.3	186.0	131.2	131.1	3.3	122.4	253.3	254.3
8	140.6	194.4	262.0	164.5	140.6	136.7	3.9	138.1	225.0	229.7
9	143.3	205.8	249.4	154.8	143.2	139.3	7.3	151.4	211.4	218.8
10	129.7	219.5	222.3	147.7	128.9	142.2	14.9	167.2	196.0	207.0
11	108.8	217.5	216.7	155.6	108.8	149.4	.7	158.0	188.2	201.5

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.378	.464	.956	.646	.378	.353	.974	1.272
2	.384	.468	.939	.619	.384	.348	.947	1.241
3	.386	.471	.918	.590	.386	.348	.941	1.243
4	.380	.475	.878	.560	.380	.349	.955	1.215
5	.374	.479	.848	.541	.373	.350	.975	1.190
6	.368	.481	.826	.529	.368	.355	1.001	1.176
7	.370	.489	.796	.507	.370	.357	1.000	1.135
8	.399	.533	.744	.452	.399	.375	.973	1.020
9	.407	.566	.708	.426	.407	.383	.973	.948
10	.367	.606	.629	.408	.364	.392	1.104	.868
11	.306	.599	.610	.429	.306	.412	1.374	.967

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	4.8	2.3	2.6	.414	.814	.131	.128	.027	.026
2	10.00	4.8	2.3	2.1	.435	.809	.141	.139	.029	.029
3	20.00	5.7	3.0	2.6	.454	.804	.150	.149	.031	.031
4	30.00	6.7	3.6	2.8	.462	.846	.123	.122	.026	.026
5	36.00	7.3	3.9	2.9	.465	.872	.106	.106	.022	.022
6	42.00	8.0	4.3	3.3	.464	.902	.083	.083	.018	.018
7	50.00	8.2	4.0	4.0	.471	.911	.078	.078	.017	.017
8	70.00	6.2	1.0	3.9	.514	.884	.116	.116	.026	.026
9	80.00	4.3	-1.1	3.7	.531	.871	.142	.142	.033	.033
10	90.00	3.0	-2.2	4.0	.505	.909	.124	.124	.029	.029
11	95.00	7.0	2.1	11.0	.455	.929	.103	.103	.023	.023

TABLE IX. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(a) 100 Percent of design speed; reading 123

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	44.9	-1.0	44.9	-1.0	408.0	1.000	25.08	.970
2	22.647	22.685	44.4	.9	44.4	.9	404.9	1.000	25.15	.970
3	21.727	21.801	44.3	1.7	44.3	1.7	399.0	1.000	25.05	.972
4	20.823	20.922	43.8	1.6	43.8	1.6	394.5	1.000	25.00	.975
5	20.287	20.401	43.3	1.0	43.3	1.0	392.6	1.000	24.91	.975
6	19.756	19.883	42.4	.3	42.4	.3	391.1	1.000	24.75	.976
7	19.060	19.205	43.4	.2	43.4	.2	389.3	1.000	24.47	.981
8	17.369	17.567	46.9	-.6	46.9	-.6	385.0	1.000	24.28	.979
9	16.548	16.787	50.4	2.0	50.4	2.0	385.3	1.000	24.31	.972
10	15.740	16.040	54.2	1.7	54.2	1.7	386.8	1.000	24.02	.953
11	15.339	15.682	51.5	.2	51.5	.2	388.1	1.000	23.65	.959

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	230.4	168.0	230.4	168.0	163.1	168.0	162.7	-2.8	.0	.0
2	232.6	169.3	232.6	169.3	166.2	169.2	162.7	2.7	.0	.0
3	235.5	168.7	235.5	168.7	168.5	168.7	164.5	5.0	.0	.0
4	236.6	167.4	236.6	167.4	170.7	167.3	163.8	4.6	.0	.0
5	237.9	165.4	237.9	165.4	173.1	165.4	163.2	2.8	.0	.0
6	236.7	162.1	236.7	162.1	174.7	162.1	159.8	.7	.0	.0
7	236.4	158.1	236.4	158.1	171.7	158.1	162.4	.5	.0	.0
8	241.0	155.5	241.0	155.5	164.7	155.5	176.0	-1.5	.0	.0
9	246.2	149.6	246.2	149.6	156.8	149.5	189.8	5.3	.0	.0
10	255.6	132.7	255.6	132.7	149.5	132.6	207.4	3.9	.0	.0
11	253.3	125.4	253.3	125.4	157.8	125.4	198.1	.5	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.589	.423	.589	.423	.417	.423	1.030	.945
2	.597	.428	.597	.428	.427	.428	1.018	.938
3	.610	.430	.610	.430	.437	.429	1.001	.942
4	.617	.428	.617	.428	.445	.428	.980	.932
5	.622	.424	.622	.424	.453	.424	.955	.922
6	.620	.416	.620	.416	.458	.416	.928	.892
7	.621	.407	.621	.407	.451	.407	.920	.900
8	.638	.402	.638	.402	.436	.402	.944	.959
9	.652	.386	.652	.386	.415	.386	.953	1.031
10	.678	.341	.678	.341	.396	.341	.887	1.122
11	.670	.321	.670	.321	.417	.321	.795	1.028

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	9.7	4.0	13.9	.551	.000	.144	.144	.056	.056
2	10.00	9.4	3.7	14.2	.535	.000	.139	.139	.053	.053
3	20.00	9.6	3.9	12.9	.532	.000	.125	.125	.046	.046
4	30.00	9.1	3.5	11.9	.529	.000	.117	.112	.039	.039
5	36.00	8.4	2.8	11.1	.536	.000	.100	.108	.037	.037
6	42.00	7.0	1.5	10.3	.539	.000	.105	.105	.035	.035
7	50.00	7.2	1.7	10.1	.552	.000	.083	.083	.027	.027
8	70.00	7.9	2.6	9.8	.571	.000	.088	.088	.026	.026
9	80.00	9.0	3.8	13.3	.602	.000	.112	.112	.031	.031
10	90.00	9.1	4.0	15.3	.692	.000	.176	.176	.047	.047
11	95.00	4.0	-1.0	15.7	.706	.000	.158	.158	.041	.041

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(b) 100 Percent of design speed; reading 1140

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	39.9	.6	39.9	.6	390.7	1.000	22.47	.974
2	22.647	22.685	39.3	1.2	39.3	1.2	388.5	1.000	22.56	.978
3	21.727	21.801	37.6	.4	37.6	.4	383.6	1.000	22.62	.986
4	20.823	20.922	37.6	-.1	37.6	-.1	380.7	1.000	22.53	.988
5	20.287	20.401	37.9	-.7	37.9	-.7	379.6	1.000	22.47	.988
6	19.756	19.883	37.4	-1.2	37.4	-1.2	378.9	1.000	22.47	.988
7	19.060	19.205	36.9	-1.0	36.9	-1.0	378.4	1.000	22.69	.986
8	17.369	17.567	37.5	-1.9	37.5	-1.9	376.9	1.000	23.30	.985
9	16.548	16.787	39.4	-1.5	39.4	-1.5	378.1	1.000	23.32	.987
10	15.740	16.040	41.5	.6	41.5	.6	380.1	1.000	23.30	.949
11	15.339	15.682	41.5	.2	41.5	.2	380.9	1.000	23.04	.939

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	223.1	169.2	223.1	169.2	171.3	169.2	143.0	1.6	.0	.0
2	225.8	173.5	225.8	173.5	174.7	173.5	143.0	3.5	.0	.0
3	228.4	178.6	228.4	178.6	181.0	178.6	139.3	1.2	.0	.0
4	229.7	178.3	229.7	178.3	182.1	178.3	140.0	-.4	.0	.0
5	230.7	176.8	230.7	176.8	182.0	176.8	141.8	-2.2	.0	.0
6	232.6	177.3	232.6	177.3	184.7	177.3	141.3	-3.8	.0	.0
7	239.9	181.8	239.9	181.8	191.8	181.8	144.0	-3.2	.0	.0
8	256.4	199.4	256.4	199.4	203.3	199.2	156.2	-6.7	.0	.0
9	262.5	200.4	262.5	200.4	202.9	200.4	166.6	-5.4	.0	.0
10	268.1	185.8	268.1	185.8	200.7	185.8	177.8	1.8	.0	.0
11	266.5	174.6	266.5	174.6	199.6	174.6	176.6	.6	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.582	.435	.582	.435	.447	.435	.988	.822
2	.592	.448	.592	.448	.458	.448	.993	.815
3	.603	.465	.603	.465	.478	.465	.987	.777
4	.609	.466	.609	.466	.483	.466	.979	.773
5	.613	.463	.613	.463	.483	.463	.972	.779
6	.619	.465	.619	.465	.492	.465	.960	.764
7	.640	.477	.640	.477	.512	.477	.948	.763
8	.690	.527	.690	.527	.547	.526	.980	.784
9	.707	.529	.707	.529	.546	.529	.988	.821
10	.721	.487	.721	.487	.540	.487	.926	.857
11	.716	.456	.716	.456	.536	.456	.875	.823

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	4.0	-1.7	14.8	.489	.000	.128	.128	.050	.050	
2	10.00	3.7	-2.0	13.8	.468	.000	.107	.107	.041	.041	
3	20.00	2.2	-3.5	11.0	.440	.000	.065	.065	.024	.024	
4	30.00	2.2	-3.4	9.6	.439	.000	.052	.052	.018	.018	
5	36.00	2.4	-3.2	8.8	.447	.000	.054	.054	.019	.019	
6	42.00	1.4	-4.2	8.2	.446	.000	.052	.052	.017	.017	
7	50.00	.1	-5.4	8.3	.440	.000	.058	.058	.019	.019	
8	70.00	-2.1	-7.4	7.8	.409	.000	.054	.054	.016	.016	
9	80.00	-2.7	-7.9	9.1	.419	.000	.047	.047	.013	.013	
10	90.00	-4.1	-9.3	13.6	.481	.000	.174	.174	.047	.047	
11	95.00	-6.5	-11.5	15.1	.516	.000	.211	.211	.055	.055	

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES
FOR SECOND-STAGE STATOR

(c) 100 Percent of design speed; reading 1157

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP IN RATIO	TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT		IN	RATIO
1	23.109	23.129	41.9	2.2	41.9	2.2	396.6	1.000	23.45 .979
2	22.647	22.685	41.7	2.9	41.7	2.9	394.4	1.000	23.47 .979
3	21.727	21.801	40.3	1.9	40.3	1.9	389.7	1.000	23.56 .979
4	20.823	20.922	40.1	1.3	40.1	1.3	385.5	1.000	23.40 .985
5	20.287	20.401	40.3	.6	40.3	.6	384.1	1.000	23.29 .987
6	19.756	19.883	39.4	-.2	39.4	-.2	383.3	1.000	23.29 .987
7	19.060	19.205	38.6	-.4	38.6	-.4	381.7	1.000	23.40 .986
8	17.369	17.567	39.6	-1.9	39.6	-1.9	378.6	1.000	23.79 .986
9	16.548	16.787	42.1	-.7	42.1	-.7	379.6	1.000	23.68 .988
10	15.740	16.040	45.0	.8	45.0	.8	381.5	1.000	23.65 .952
11	15.339	15.682	45.0	.2	45.0	.2	382.3	1.000	23.21 .949

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	227.9	172.6	227.9	172.6	169.5	172.4	152.3	6.6	.0	.0
2	229.3	173.2	229.3	173.2	171.3	173.0	152.5	8.8	.0	.0
3	232.3	174.1	232.3	174.1	177.2	174.0	150.2	5.7	.0	.0
4	232.5	173.3	232.5	173.3	177.9	173.2	149.6	4.0	.0	.0
5	233.1	172.2	233.1	172.2	177.8	172.2	150.7	1.8	.0	.0
6	234.8	172.2	234.8	172.2	181.5	172.2	149.0	-.5	.0	.0
7	240.4	174.9	240.4	174.9	188.0	174.9	149.8	-1.1	.0	.0
8	251.0	185.9	251.0	185.9	193.3	185.8	160.1	-6.0	.0	.0
9	255.7	183.8	255.7	183.8	189.7	183.8	171.5	-2.3	.0	.0
10	261.1	166.4	261.1	166.4	184.7	166.4	184.5	2.4	.0	.0
11	256.9	152.5	256.9	152.5	181.6	152.5	181.7	.7	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.591	.441	.591	.441	.440	.441	1.017	.873
2	.597	.444	.597	.444	.446	.443	1.010	.867
3	.609	.449	.609	.449	.464	.449	.982	.841
4	.613	.450	.613	.450	.469	.449	.974	.831
5	.616	.447	.616	.447	.470	.447	.968	.832
6	.621	.448	.621	.448	.480	.448	.949	.810
7	.639	.456	.639	.456	.500	.456	.930	.799
8	.672	.488	.672	.488	.518	.488	.961	.820
9	.685	.482	.685	.482	.508	.482	.969	.867
10	.699	.433	.699	.433	.495	.433	.901	.919
11	.686	.396	.686	.396	.485	.396	.840	.882

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	6.0	.2	16.3	.492	.000	.102	.102	.040	.040
2	10.00	6.0	.2	15.4	.485	.000	.098	.098	.037	.037
3	20.00	4.8	-.9	12.3	.479	.000	.093	.093	.034	.034
4	30.00	4.6	-1.0	10.9	.475	.000	.068	.068	.024	.024
5	36.00	4.6	-1.0	9.9	.480	.000	.057	.057	.020	.020
6	42.00	3.2	-2.3	9.1	.479	.000	.058	.058	.019	.019
7	50.00	1.6	-3.9	8.8	.475	.000	.057	.057	.018	.018
8	70.00	-.1	-5.4	7.8	.454	.000	.052	.052	.015	.015
9	80.00	-.0	-5.3	9.8	.471	.000	.046	.046	.013	.013
10	90.00	-.8	-6.0	13.7	.548	.000	.173	.173	.046	.046
11	95.00	-3.1	-8.2	15.0	.589	.000	.190	.190	.050	.050

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(d) 100 Percent of design speed; reading 1168

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	34.3	-1.6	34.3	-1.6	381.2	1.000	20.22	.979
2	22.647	22.685	32.8	-.3	32.8	-.3	379.2	1.000	20.50	.983
3	21.727	21.801	30.2	-1.1	30.2	-1.1	374.4	1.000	20.86	.984
4	20.823	20.922	30.3	-1.2	30.3	-1.2	372.2	1.000	20.82	.988
5	20.287	20.401	31.1	-1.4	31.1	-1.4	371.7	1.000	20.77	.987
6	19.756	19.883	31.1	-1.8	31.1	-1.8	371.1	1.000	20.65	.987
7	19.060	19.205	31.7	-2.3	31.7	-2.3	370.9	1.000	20.66	.988
8	17.369	17.567	33.8	-2.5	33.8	-2.5	372.9	1.000	21.51	.983
9	16.548	16.787	35.3	-1.3	35.3	-1.3	375.8	1.000	22.25	.984
10	15.740	16.040	37.9	1.1	37.9	1.1	379.8	1.000	22.75	.951
11	15.339	15.682	38.2	1.0	38.2	1.0	380.3	1.000	22.35	.924

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL IN	SPEED OUT
	IN	OUT	IN	OUT	IN	OUT	IN	OUT		
1	214.9	174.4	214.9	174.4	177.6	174.3	121.0	-4.8	.0	.0
2	222.1	184.0	222.1	184.0	186.6	184.0	120.5	-.8	.0	.0
3	230.0	193.6	230.0	193.6	198.7	193.5	115.7	-3.6	.0	.0
4	232.2	194.9	232.2	194.9	200.5	194.8	117.0	-4.0	.0	.0
5	232.4	193.3	232.4	193.3	199.0	193.3	119.9	-4.6	.0	.0
6	231.3	191.6	231.3	191.6	198.2	191.5	119.4	-6.0	.0	.0
7	233.9	192.5	233.9	192.5	199.0	192.3	122.9	-7.6	.0	.0
8	257.0	217.3	257.0	217.3	213.7	217.1	142.8	-9.5	.0	.0
9	274.6	236.1	274.6	236.1	224.1	236.0	158.7	-5.5	.0	.0
10	287.0	233.9	287.0	233.9	226.6	233.9	176.2	4.4	.0	.0
11	282.9	213.6	282.9	213.6	222.3	213.6	175.0	3.6	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.567	.455	.567	.455	.468	.455	.982	.681
2	.589	.483	.589	.483	.495	.483	.986	.659
3	.615	.512	.615	.512	.532	.512	.974	.615
4	.624	.518	.624	.518	.539	.518	.972	.624
5	.625	.514	.625	.514	.535	.514	.971	.625
6	.622	.509	.622	.509	.533	.509	.967	.622
7	.630	.512	.630	.512	.536	.511	.966	.630
8	.696	.581	.696	.581	.578	.580	1.016	.696
9	.745	.632	.745	.632	.608	.632	1.053	.745
10	.778	.622	.778	.622	.614	.622	1.032	.778
11	.765	.564	.765	.564	.601	.564	.961	.765

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	-1.7	-7.5	12.5	.417	.000	.107	.107	.042	.042
2	10.00	-2.9	-8.6	12.2	.381	.000	.083	.083	.032	.032
3	20.00	-5.3	-11.0	9.4	.349	.000	.070	.070	.026	.026
4	30.00	-5.2	-10.8	8.4	.344	.000	.052	.052	.018	.018
5	36.00	-4.6	-10.2	8.0	.352	.000	.058	.058	.020	.020
6	42.00	-5.1	-10.7	7.5	.353	.000	.055	.055	.018	.018
7	50.00	-5.3	-10.7	6.9	.357	.000	.052	.052	.017	.017
8	70.00	-6.0	-11.3	7.1	.328	.000	.061	.061	.018	.018
9	80.00	-6.8	-12.1	9.2	.307	.000	.051	.051	.014	.014
10	90.00	-7.9	-13.1	14.0	.344	.000	.147	.147	.039	.039
11	95.00	-10.0	-15.0	15.7	.402	.000	.236	.236	.062	.062

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(e) 80 Percent of design speed; reading 136

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	25.4	-3.7	25.4	-3.7	339.2	1.000	15.14	.988
2	22.647	22.685	23.9	-3.2	23.9	-3.2	338.5	1.000	15.57	.989
3	21.727	21.801	20.8	-3.8	20.8	-3.8	336.0	1.000	15.86	.985
4	20.823	20.922	21.0	-4.0	21.0	-4.0	335.2	1.000	15.99	.982
5	20.287	20.401	22.1	-3.6	22.1	-3.6	335.6	1.000	16.03	.985
6	19.756	19.883	23.1	-3.1	23.1	-3.1	336.5	1.000	16.11	.986
7	19.060	19.205	24.2	-2.8	24.2	-2.8	337.6	1.000	16.32	.982
8	17.369	17.567	26.5	-3.8	26.5	-3.8	340.1	1.000	16.94	.983
9	16.548	16.787	28.8	-2.5	28.8	-2.5	343.0	1.000	17.47	.978
10	15.740	16.040	32.6	.8	32.6	.8	347.5	1.000	17.85	.959
11	15.339	15.682	32.6	.7	32.6	.7	348.7	1.000	17.91	.921

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	157.5	148.6	157.5	148.6	142.3	148.3	67.5	-9.6	.0	.0
2	173.7	164.8	173.7	164.8	158.8	164.5	70.4	-9.3	.0	.0
3	186.2	176.2	186.2	176.2	174.1	175.8	66.0	-11.7	.0	.0
4	190.6	179.3	190.6	179.3	178.0	178.9	68.3	-12.5	.0	.0
5	192.8	182.5	192.8	182.5	178.7	182.1	72.4	-11.3	.0	.0
6	196.2	186.0	196.2	186.0	180.5	185.7	76.9	-10.2	.0	.0
7	203.2	191.6	203.2	191.6	185.4	191.4	83.3	-9.4	.0	.0
8	227.7	213.8	227.7	213.8	203.7	213.3	101.7	-14.3	.0	.0
9	241.8	229.7	241.8	229.7	211.8	229.5	116.6	-10.1	.0	.0
10	255.8	233.7	255.8	233.7	215.5	233.6	137.8	3.4	.0	.0
11	258.0	220.5	258.0	220.5	217.2	220.5	139.1	2.9	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.435	.409	.435	.409	.393	.408	1.042	.435
2	.482	.456	.482	.456	.441	.455	1.036	.482
3	.520	.491	.520	.491	.486	.490	1.010	.520
4	.534	.501	.534	.501	.499	.500	1.005	.534
5	.540	.510	.540	.510	.501	.509	1.019	.540
6	.549	.519	.549	.519	.505	.519	1.029	.549
7	.569	.535	.569	.535	.519	.534	1.032	.569
8	.641	.599	.641	.599	.573	.597	1.047	.641
9	.681	.644	.681	.644	.596	.643	1.084	.681
10	.719	.651	.719	.651	.606	.651	1.084	.719
11	.724	.611	.724	.611	.610	.611	1.015	.724

RP	PERCENT SPAN		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS	SS				TOT	PROF	TOT	PROF
1	5.00	-10.1	-15.8		10.9	.248	.000	.100	.100	.039	.039
2	10.00	-11.3	-17.0		9.8	.227	.000	.078	.078	.030	.030
3	20.00	-14.2	-19.9		7.1	.207	.000	.088	.088	.032	.032
4	30.00	-13.9	-19.6		6.1	.208	.000	.101	.101	.035	.035
5	36.00	-13.1	-18.7		6.3	.203	.000	.083	.083	.028	.028
6	42.00	-12.6	-18.1		6.6	.200	.000	.075	.075	.025	.025
7	50.00	-12.3	-17.8		6.9	.204	.000	.090	.090	.029	.029
8	70.00	-12.7	-18.0		6.3	.211	.000	.071	.071	.021	.021
9	80.00	-12.8	-18.0		8.5	.196	.000	.084	.084	.024	.024
10	90.00	-12.7	-17.8		14.2	.226	.000	.139	.139	.037	.037
11	95.00	-15.0	-20.0		16.0	.282	.000	.269	.269	.070	.070

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES
FOR SECOND-STAGE STATOR

(f) 80 Percent of design speed; reading 159

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	36.6	-1.4	36.6	-1.4	354.1	1.000	17.53	.984
2	22.647	22.685	36.0	-.6	36.0	.6	352.6	1.000	17.64	.988
3	21.727	21.801	34.1	-.6	34.1	-.6	349.1	1.000	17.64	.991
4	20.823	20.922	33.2	-1.9	33.2	-1.9	347.1	1.000	17.67	.991
5	20.287	20.401	34.1	-1.9	34.1	-1.9	346.9	1.000	17.69	.992
6	19.756	19.883	34.7	-1.6	34.7	-1.6	347.1	1.000	17.72	.990
7	19.060	19.205	35.6	-1.3	35.6	-1.3	347.3	1.000	17.80	.988
8	17.369	17.567	37.8	-2.6	37.8	-2.6	347.0	1.000	18.13	.989
9	16.548	16.787	40.6	-1.7	40.6	-1.7	348.2	1.000	18.27	.990
10	15.740	16.040	43.2	.2	43.2	.2	350.0	1.000	18.44	.964
11	15.339	15.682	41.5	-.5	41.5	-.5	350.7	1.000	18.34	.949

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	174.5	137.7	174.5	137.7	140.1	137.6	103.9	-3.3	.0	.0
2	178.6	144.4	178.6	144.4	144.5	144.4	105.0	1.6	.0	.0
3	181.2	148.4	181.2	148.4	150.2	148.4	101.5	-1.6	.0	.0
4	182.7	149.4	182.7	149.4	152.9	149.3	100.1	-4.8	.0	.0
5	185.0	150.4	185.0	150.4	153.2	150.3	103.7	-4.9	.0	.0
6	187.2	150.9	187.2	150.9	153.9	150.9	106.7	-4.2	.0	.0
7	192.2	153.3	192.2	153.3	156.3	153.3	111.8	-3.4	.0	.0
8	205.1	167.9	205.1	167.9	162.1	167.7	125.7	-7.6	.0	.0
9	213.1	173.7	213.1	173.7	161.8	173.6	138.7	-5.3	.0	.0
10	224.0	166.8	224.0	166.8	163.2	166.8	153.4	.6	.0	.0
11	223.9	155.1	223.9	155.1	167.6	155.1	148.5	-1.3	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.473	.370	.473	.370	.380	.370	.982	.619
2	.486	.389	.486	.389	.393	.389	.999	.618
3	.496	.403	.496	.403	.411	.403	.988	.578
4	.502	.407	.502	.407	.420	.407	.976	.553
5	.508	.410	.508	.410	.421	.409	.981	.574
6	.515	.411	.515	.411	.423	.411	.981	.587
7	.529	.418	.529	.418	.430	.418	.980	.608
8	.567	.459	.567	.459	.448	.459	1.034	.661
9	.589	.475	.589	.475	.447	.475	1.073	.724
10	.620	.454	.620	.454	.452	.454	1.022	.786
11	.619	.421	.619	.421	.463	.421	.926	.723

RP	PERCENT SPAN	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
		MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	1.1	-4.6	13.3	.451	.000	.116	.116	.045	.045
2	10.00	.8	-4.9	13.7	.413	.000	.083	.083	.032	.032
3	20.00	-.9	-6.6	10.3	.390	.000	.055	.055	.020	.020
4	30.00	-1.7	-7.4	8.3	.384	.000	.056	.056	.020	.020
5	36.00	-1.1	-6.6	8.0	.388	.000	.051	.051	.017	.017
6	42.00	-.9	-6.5	8.2	.391	.000	.062	.062	.021	.021
7	50.00	-.9	-6.4	8.4	.395	.000	.068	.068	.022	.022
8	70.00	-1.4	-6.7	7.5	.373	.000	.057	.057	.017	.017
9	80.00	-1.0	-6.3	9.3	.374	.000	.049	.049	.014	.014
10	90.00	-2.1	-7.2	13.6	.436	.000	.158	.158	.042	.042
11	95.00	-6.1	-11.1	14.8	.480	.000	.225	.225	.059	.059

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(g) 80 Percent of design speed; reading 172

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	44.9	.5	44.9	.5	364.5	1.000	18.21	.981
2	22.647	22.685	45.0	1.9	45.0	1.9	363.7	1.000	18.27	.980
3	21.727	21.801	46.7	1.9	46.7	1.9	361.0	1.000	18.20	.983
4	20.823	20.922	45.4	.6	45.4	.6	358.4	1.000	18.13	.984
5	20.287	20.401	44.0	.1	44.0	.1	357.1	1.000	18.08	.986
6	19.756	19.883	42.3	-.6	42.3	-.6	355.9	1.000	18.03	.989
7	19.060	19.205	42.2	-.9	42.2	-.9	354.5	1.000	18.01	.991
8	17.369	17.567	45.7	-1.0	45.7	-1.0	351.2	1.000	18.23	.988
9	16.548	16.787	47.9	.6	47.9	.6	351.1	1.000	18.42	.982
10	15.740	16.040	50.0	.2	50.0	.2	351.4	1.000	18.29	.964
11	15.339	15.682	47.0	-1.4	47.0	-1.4	351.9	1.000	18.08	.962

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	173.1	127.4	173.1	127.4	122.7	127.4	122.1	1.0	.0	.0
2	176.0	129.5	176.0	129.5	124.4	129.5	124.4	4.3	.0	.0
3	179.7	129.0	179.7	129.0	123.3	129.0	130.7	4.3	.0	.0
4	178.7	127.0	178.7	127.0	125.6	127.0	127.1	1.4	.0	.0
5	179.8	126.5	179.8	126.5	129.3	126.5	124.9	.3	.0	.0
6	179.7	126.4	179.7	126.4	132.9	126.4	121.0	-1.2	.0	.0
7	182.1	127.3	182.1	127.3	134.9	127.3	122.4	-2.0	.0	.0
8	200.1	138.8	200.1	138.8	139.6	138.8	143.3	-2.4	.0	.0
9	207.7	139.8	207.7	139.8	139.2	139.8	154.1	1.4	.0	.0
10	215.8	126.0	215.8	126.0	138.6	126.0	165.4	.3	.0	.0
11	213.4	115.5	213.4	115.5	145.4	115.5	156.1	-2.8	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.462	.337	.462	.337	.327	.337	1.039	.736
2	.471	.343	.471	.343	.333	.343	1.041	.745
3	.483	.343	.483	.343	.331	.343	1.046	.780
4	.482	.339	.482	.339	.339	.339	1.011	.749
5	.486	.338	.486	.338	.349	.338	.979	.727
6	.487	.338	.487	.338	.360	.338	.951	.693
7	.494	.342	.494	.342	.366	.341	.944	.692
8	.549	.375	.549	.375	.383	.375	.994	.799
9	.571	.378	.571	.378	.383	.378	1.004	.848
10	.594	.339	.594	.339	.382	.339	.909	.895
11	.587	.310	.587	.310	.400	.310	.794	.806

RP	PERCENT		INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS					TOT	PROF	TOT	PROF
1	5.00	9.4	3.6		15.0	.537	.000	.142	.142	.055	.055
2	10.00	9.8	4.0		14.9	.525	.000	.139	.139	.053	.053
3	20.00	11.7	6.0		12.8	.540	.000	.118	.118	.044	.044
4	30.00	10.4	4.7		10.7	.537	.000	.109	.109	.038	.038
5	36.00	8.8	3.2		10.0	.534	.000	.093	.093	.032	.032
6	42.00	6.6	1.0		9.2	.524	.000	.077	.077	.026	.026
7	50.00	5.7	.2		8.8	.521	.000	.062	.062	.020	.020
8	70.00	6.5	1.2		9.1	.520	.000	.064	.064	.019	.019
9	80.00	6.2	1.0		11.6	.532	.000	.089	.089	.025	.025
10	90.00	4.7	-.4		13.5	.619	.000	.172	.172	.046	.046
11	95.00	-.7	-5.7		13.9	.651	.000	.184	.184	.048	.048

TABLE IX. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES
FOR SECOND-STAGE STATOR

(h) 80 Percent of design speed; reading 183

RP	RADII		ABS BETAM		REL BETAM		TOTAL TEMP		TOTAL PRESS	
	IN	OUT	IN	OUT	IN	OUT	IN	RATIO	IN	RATIO
1	23.109	23.129	39.8	.0	39.8	.0	359.6	1.000	18.09	.980
2	22.647	22.685	40.7	2.5	40.7	2.5	358.7	1.000	18.15	.985
3	21.727	21.801	40.7	1.6	40.7	1.6	355.9	1.000	18.11	.988
4	20.823	20.922	40.7	.4	40.7	.4	353.9	1.000	18.12	.987
5	20.287	20.401	40.8	.0	40.8	.0	353.3	1.000	18.09	.989
6	19.756	19.883	40.2	-.5	40.2	-.5	352.6	1.000	18.08	.988
7	19.060	19.205	40.6	-1.0	40.6	-1.0	351.6	1.000	18.03	.991
8	17.369	17.567	43.0	-2.1	43.0	-2.1	349.4	1.000	18.22	.991
9	16.548	16.787	45.3	-.1	45.3	-.1	350.0	1.000	18.45	.986
10	15.740	16.040	48.3	.5	48.3	.5	351.1	1.000	18.47	.961
11	15.339	15.682	46.0	-.8	46.0	-.8	351.5	1.000	18.17	.959

RP	ABS VEL		REL VEL		MERID VEL		TANG VEL		WHEEL SPEED	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	175.7	129.6	175.7	129.6	135.0	129.6	112.5	.1	.0	.0
2	178.4	135.2	178.4	135.2	135.2	135.1	116.3	5.9	.0	.0
3	180.2	137.6	180.2	137.6	136.7	137.6	117.4	3.8	.0	.0
4	182.1	137.4	182.1	137.4	138.0	137.4	118.8	1.0	.0	.0
5	183.4	137.4	183.4	137.4	138.9	137.4	119.8	.0	.0	.0
6	184.3	136.8	184.3	136.8	140.8	136.8	118.9	-1.2	.0	.0
7	186.4	137.2	186.4	137.2	141.5	137.1	121.3	-2.3	.0	.0
8	199.2	149.0	199.2	149.0	145.7	148.9	135.8	-5.4	.0	.0
9	208.5	152.7	208.5	152.7	146.6	152.7	148.2	-.2	.0	.0
10	218.4	140.8	218.4	140.8	145.3	140.8	163.0	1.2	.0	.0
11	213.9	127.3	213.9	127.3	148.6	127.3	153.9	-1.8	.0	.0

RP	ABS MACH NO		REL MACH NO		MERID MACH NO		MERID PEAK SS	
	IN	OUT	IN	OUT	IN	OUT	VEL R	MACH NO
1	.473	.345	.473	.345	.363	.345	.960	.672
2	.481	.361	.481	.361	.365	.361	.999	.691
3	.488	.369	.488	.369	.370	.369	1.007	.689
4	.495	.370	.495	.370	.375	.370	.996	.690
5	.499	.370	.499	.370	.378	.370	.989	.691
6	.502	.368	.502	.368	.384	.368	.971	.677
7	.509	.370	.509	.370	.386	.370	.969	.683
8	.548	.404	.548	.404	.401	.404	1.022	.745
9	.574	.414	.574	.414	.404	.414	1.042	.802
10	.502	.381	.602	.381	.401	.381	.969	.871
11	.589	.343	.589	.343	.409	.343	.857	.788

RP	PERCENT	INCIDENCE		DEV	D-FACT	EFF	LOSS COEFF		LOSS PARAM	
	SPAN	MEAN	SS				TOT	PROF	TOT	PROF
1	5.00	4.3	-1.4	14.6	.512	.000	.141	.141	.055	.055
2	10.00	5.5	-.3	15.5	.479	.000	.104	.104	.040	.040
3	20.00	5.7	-.0	12.5	.468	.000	.081	.081	.030	.030
4	30.00	5.8	.1	10.5	.473	.000	.082	.082	.029	.029
5	36.00	5.6	-.0	9.8	.475	.000	.068	.068	.023	.023
6	42.00	4.4	-1.1	9.2	.475	.000	.074	.074	.025	.025
7	50.00	4.1	-1.4	8.7	.478	.000	.053	.053	.017	.017
8	70.00	3.7	-1.6	8.0	.460	.000	.051	.051	.015	.015
9	80.00	3.6	-1.6	10.9	.466	.000	.071	.071	.020	.020
10	90.00	2.9	-2.2	13.8	.552	.000	.178	.178	.048	.048
11	95.00	-1.7	-6.7	14.4	.593	.000	.198	.198	.052	.052

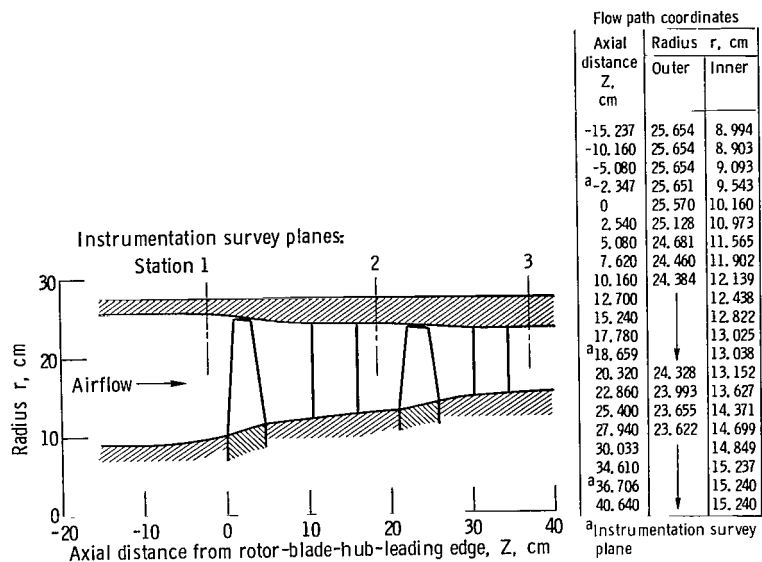


Figure 1. - Two-stage fan flow path.

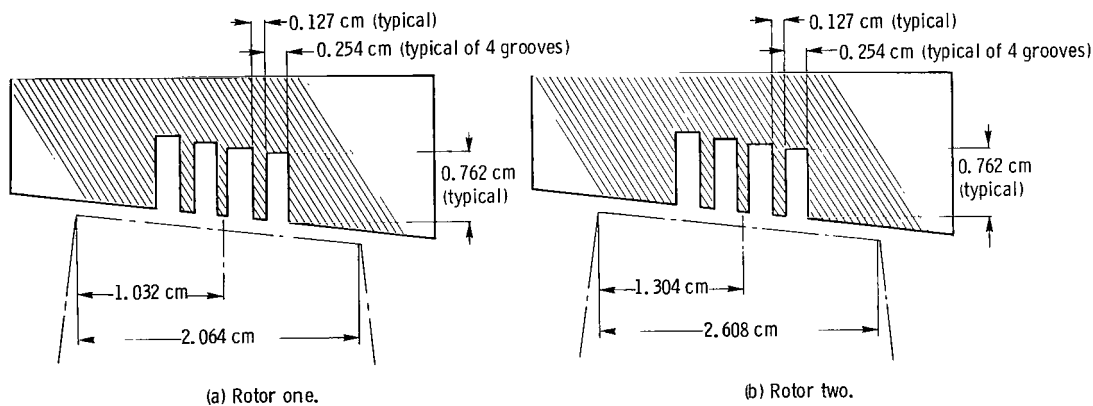


Figure 2. - Circumferentially grooved casing treatment.

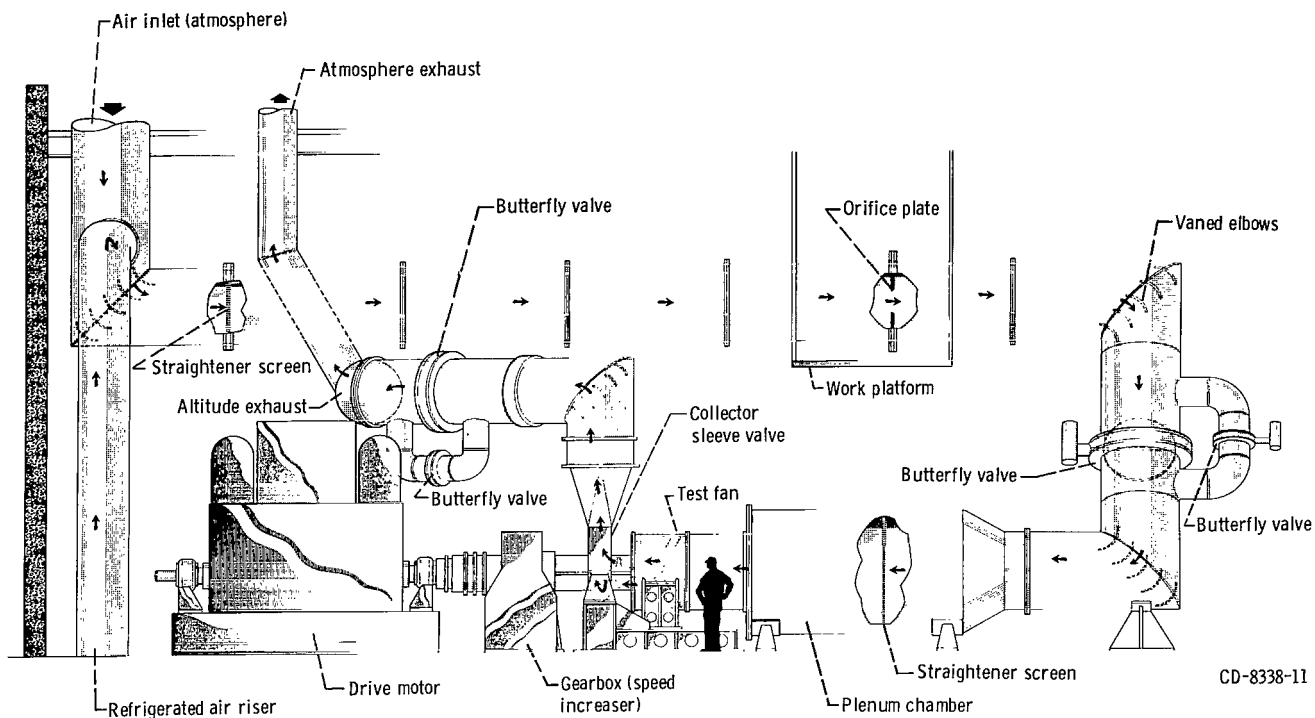


Figure 3. - Multistage compressor test facility.

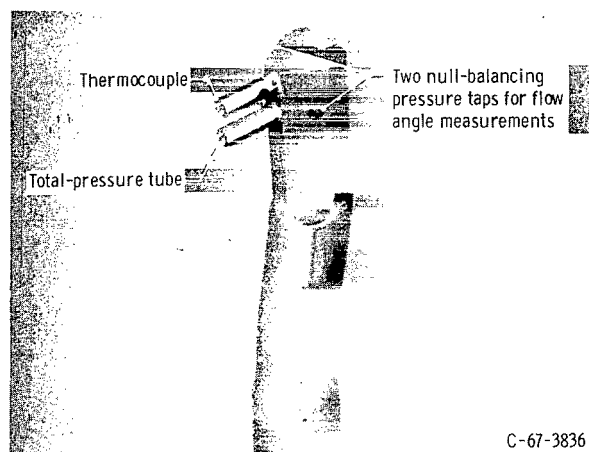


Figure 4. - Combination total-pressure, total-temperature, and flow-angle probe (double barrel).

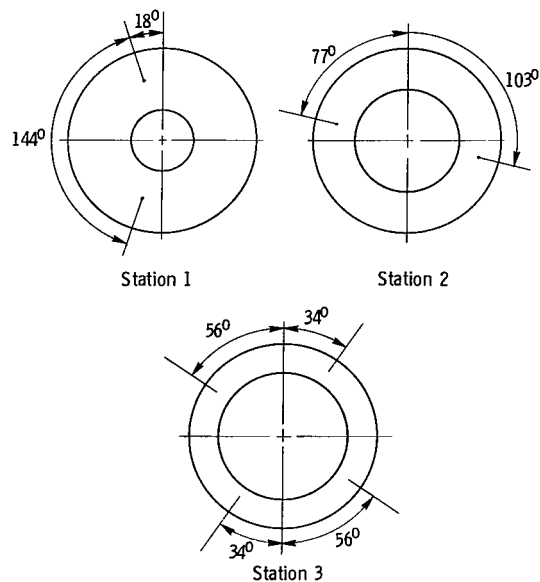


Figure 5. - Circumferential locations of combination probes (looking downstream; clockwise rotation).

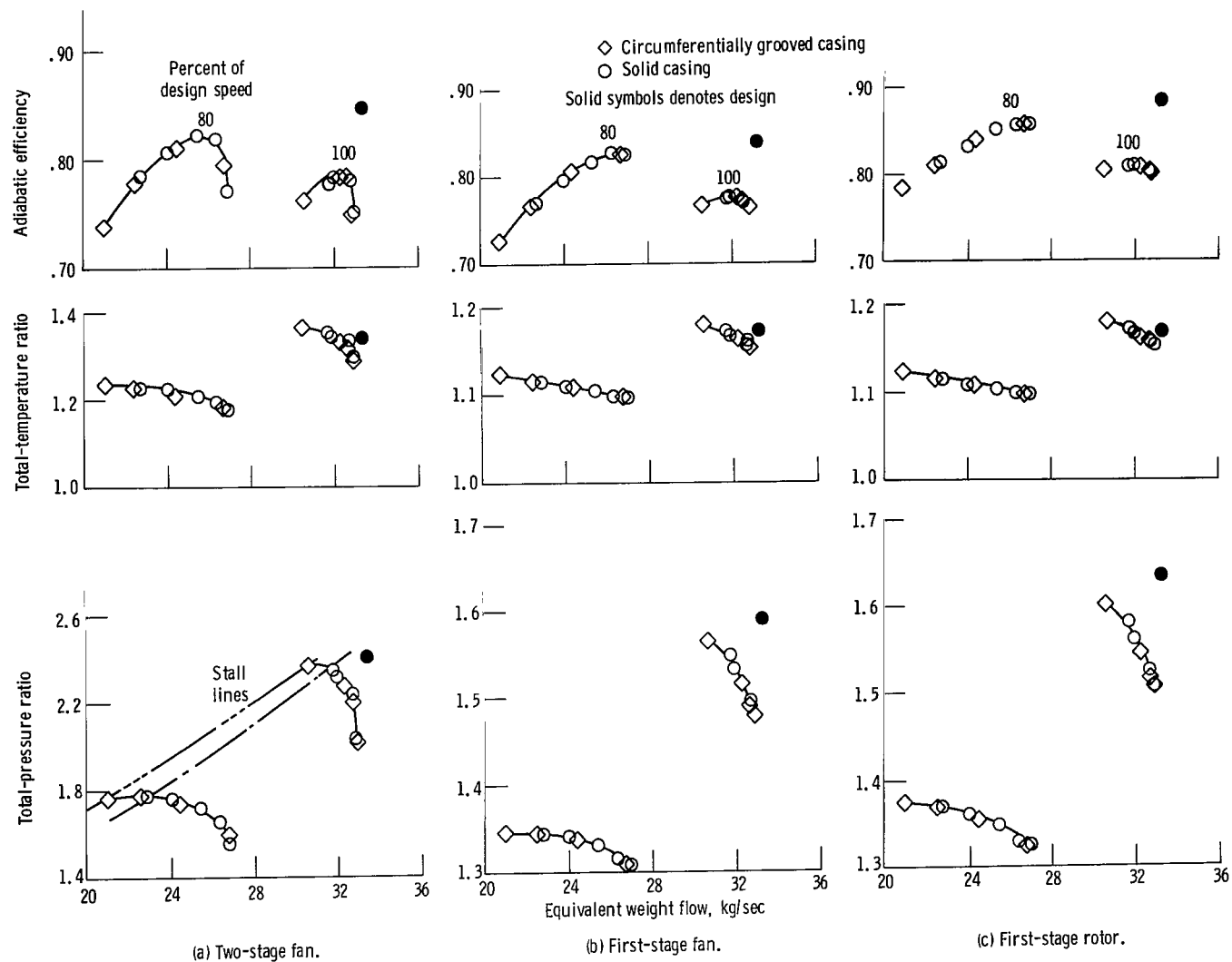


Figure 6. - Overall performance with and without casing treatment.

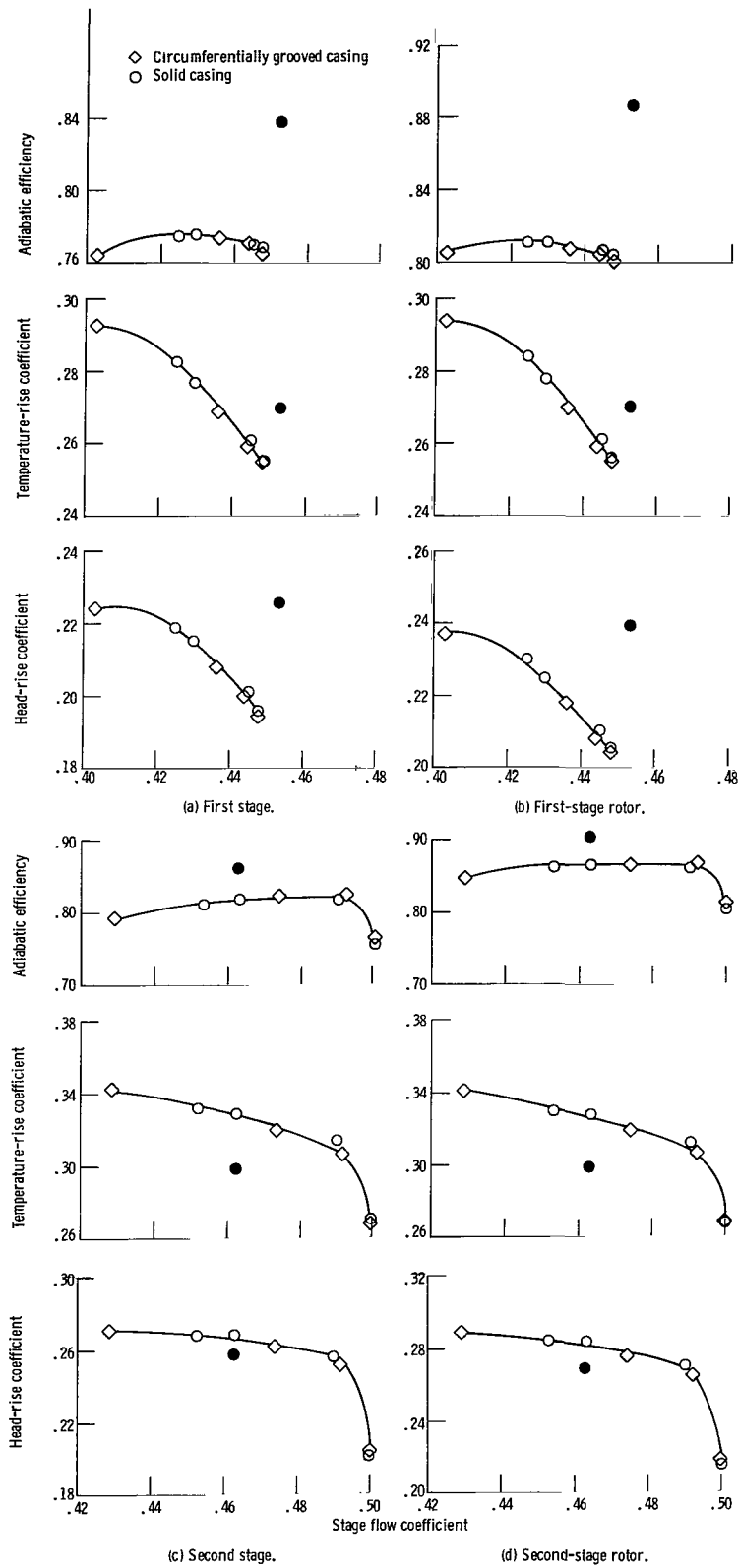
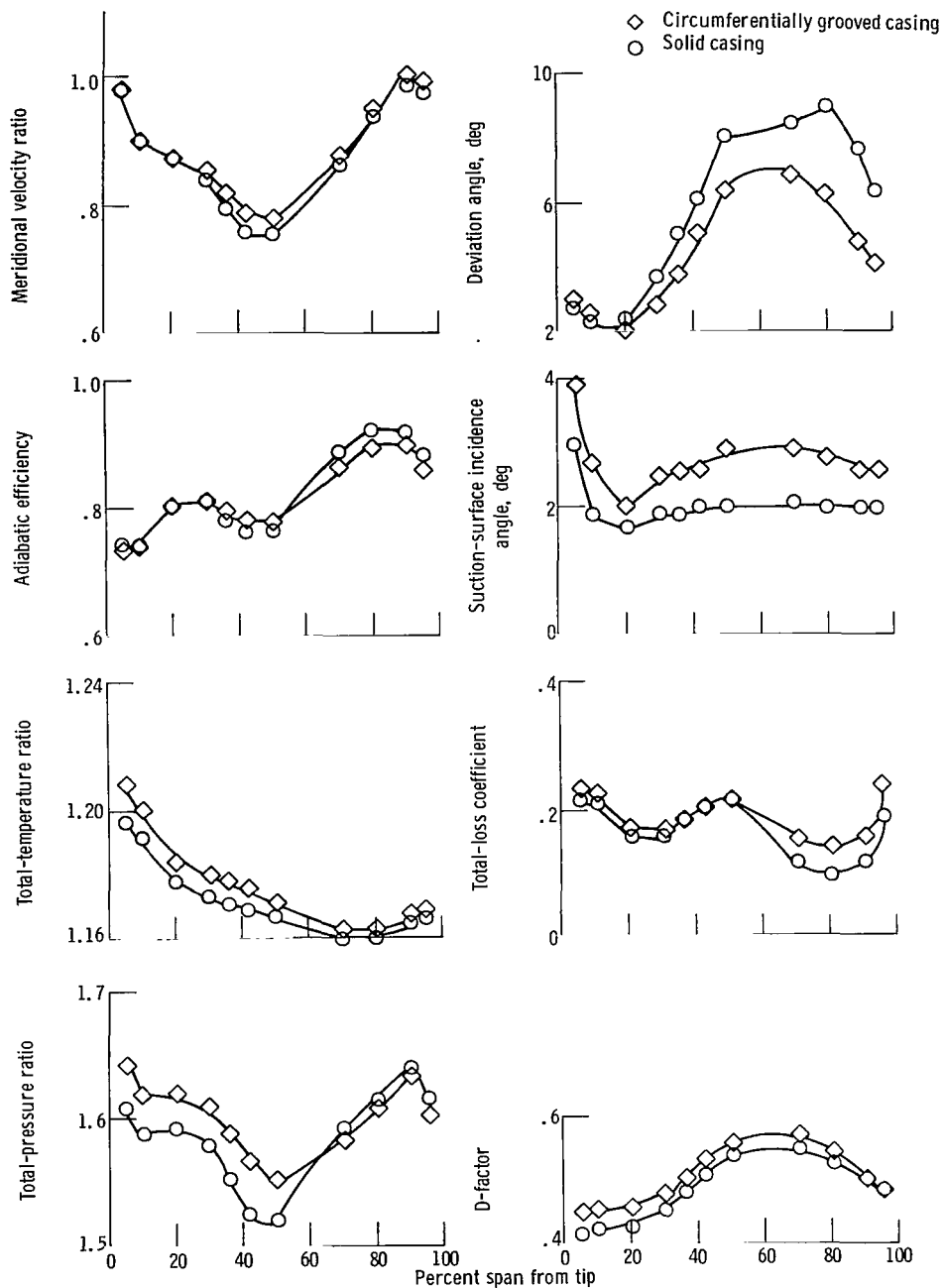
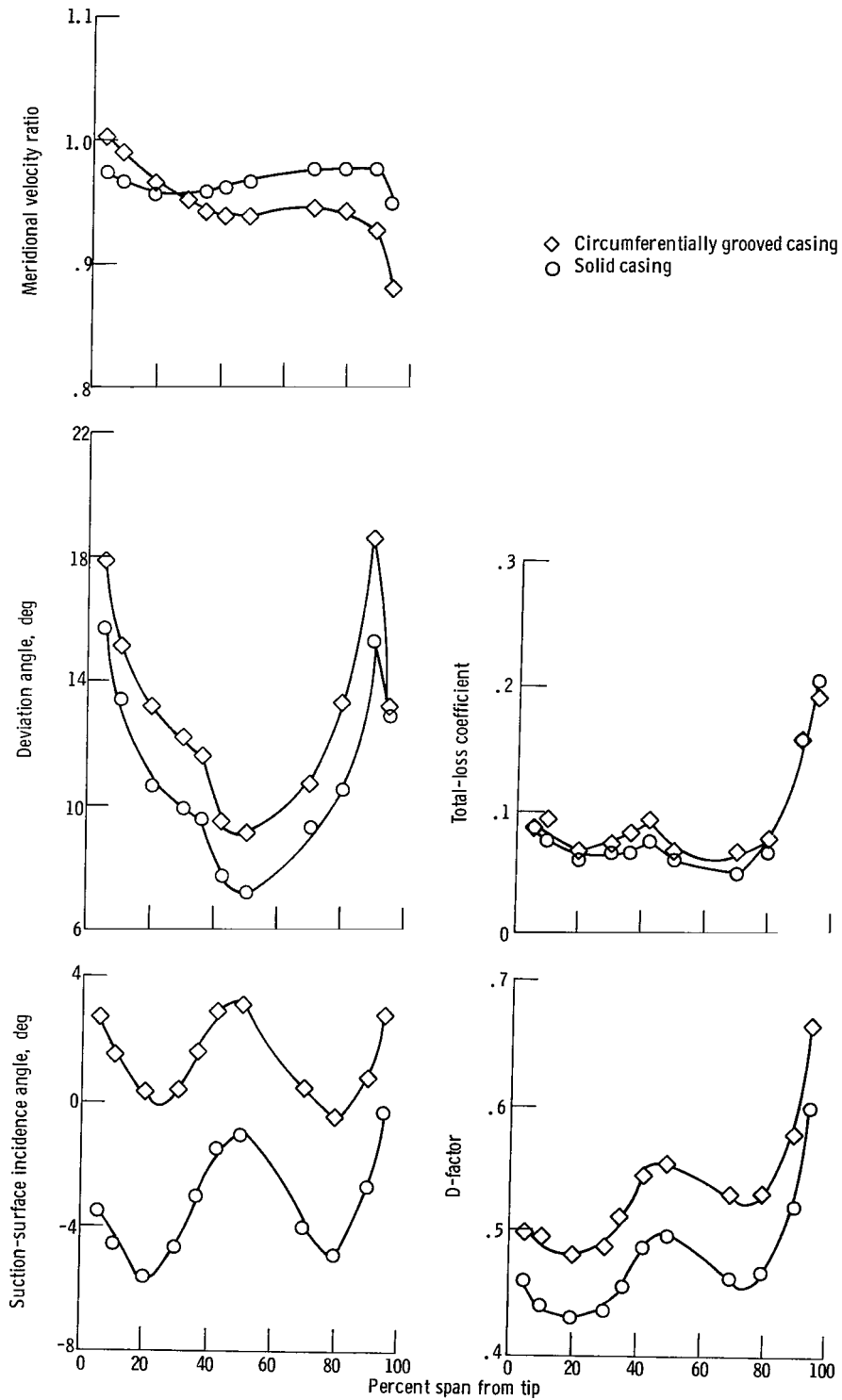


Figure 7. - Nondimensional overall performance at design speed with and without casing treatment.



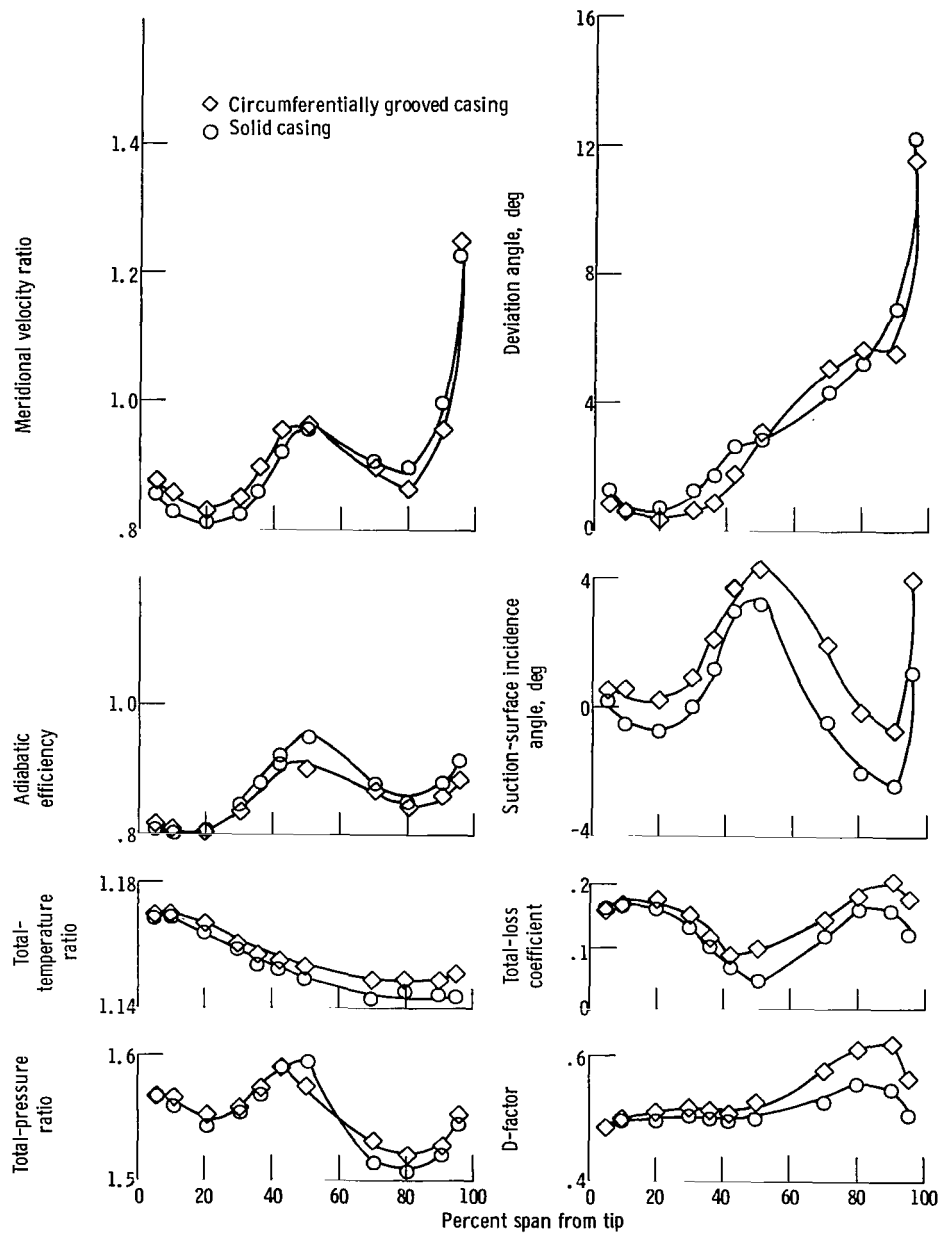
(a) First-stage rotor.

Figure 8. - Radial distributions of performance parameters with and without casing treatment at stall weight flows.



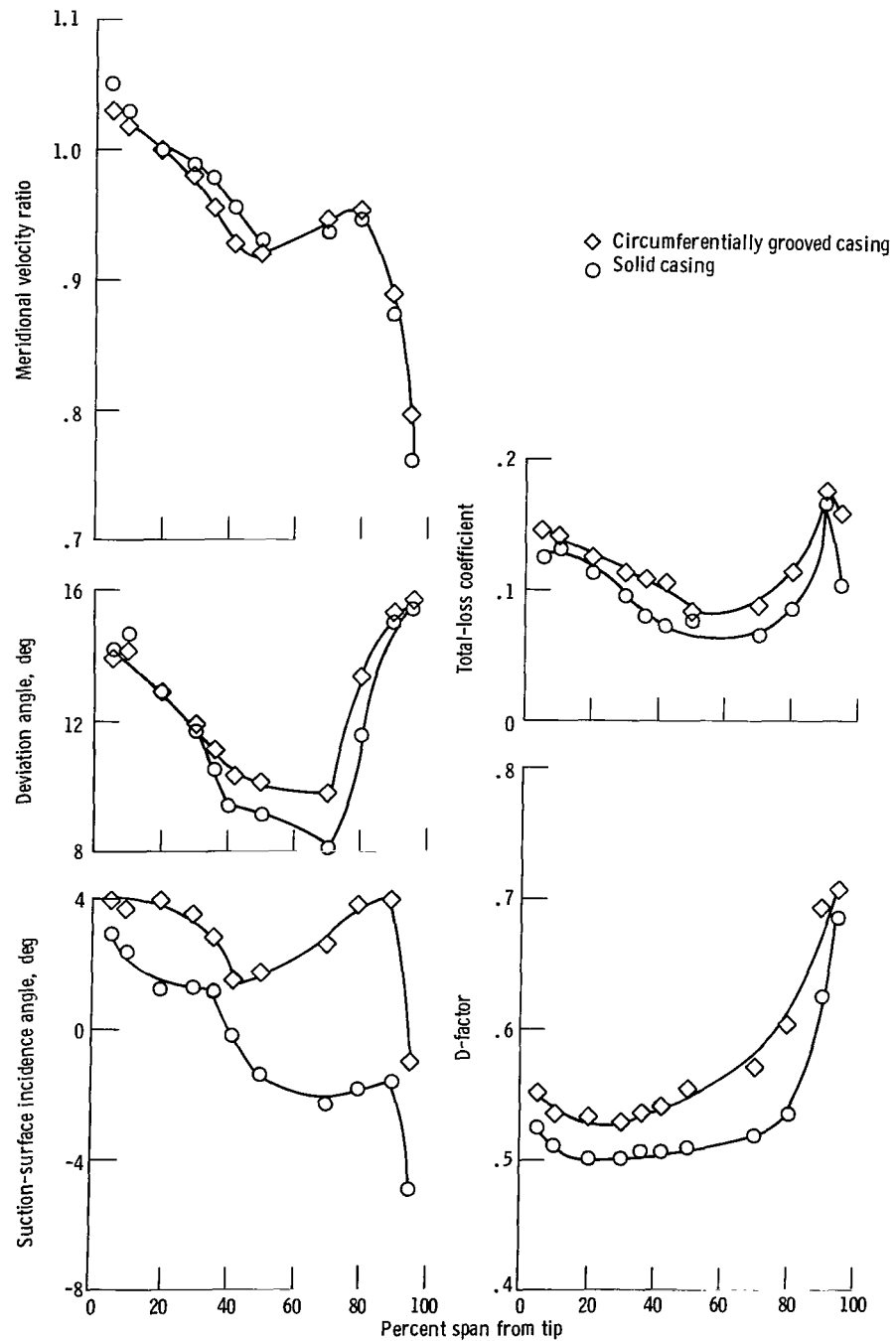
(b) First-stage stator.

Figure 8. - Continued.



(c) Second-stage rotor.

Figure 8. - Continued.



(d) Second-stage stator.

Figure 8. - Concluded.

1. Report No. NASA TP-1409		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle EFFECT OF CASING TREATMENT ON PERFORMANCE OF A TWO-STAGE HIGH-PRESSURE-RATIO FAN				5. Report Date February 1979	
7. Author(s) Donald C. Urasek				6. Performing Organization Code	
9. Performing Organization Name and Address National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio 44135				8. Performing Organization Report No. E-8997	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D. C. 20546				10. Work Unit No. 505-04	
15. Supplementary Notes				11. Contract or Grant No.	
16. Abstract A two-stage fan, previously tested with a solid casing, was tested with a casing with circumferential grooves over the tips of both rotors (casing treatment). Tests were conducted at 80 and 100 percent of design speed with uniform flow. The casing treatment improved the flow range and stall margin significantly without changing the characteristic overall performance curves of total-pressure and efficiency as functions of weight flow, other than extending them to lower weight flows.				13. Type of Report and Period Covered Technical Paper	
17. Key Words (Suggested by Author(s)) Casing treatment Fan Turbomachinery				14. Sponsoring Agency Code	
18. Distribution Statement Unclassified - unlimited STAR Category 07					
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 67	
				22. Price* A04	

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